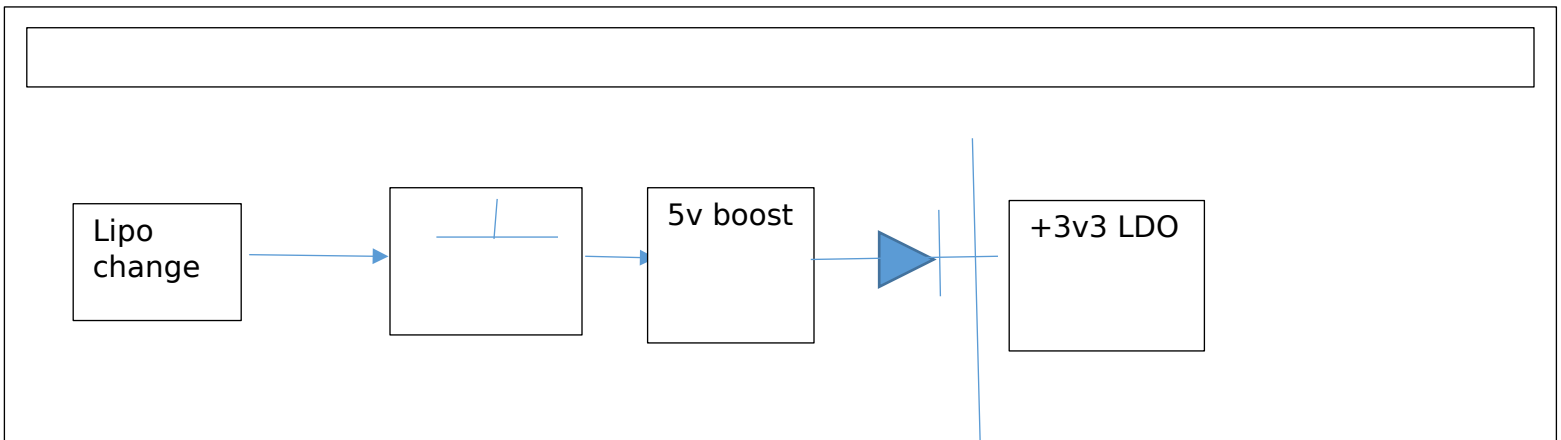
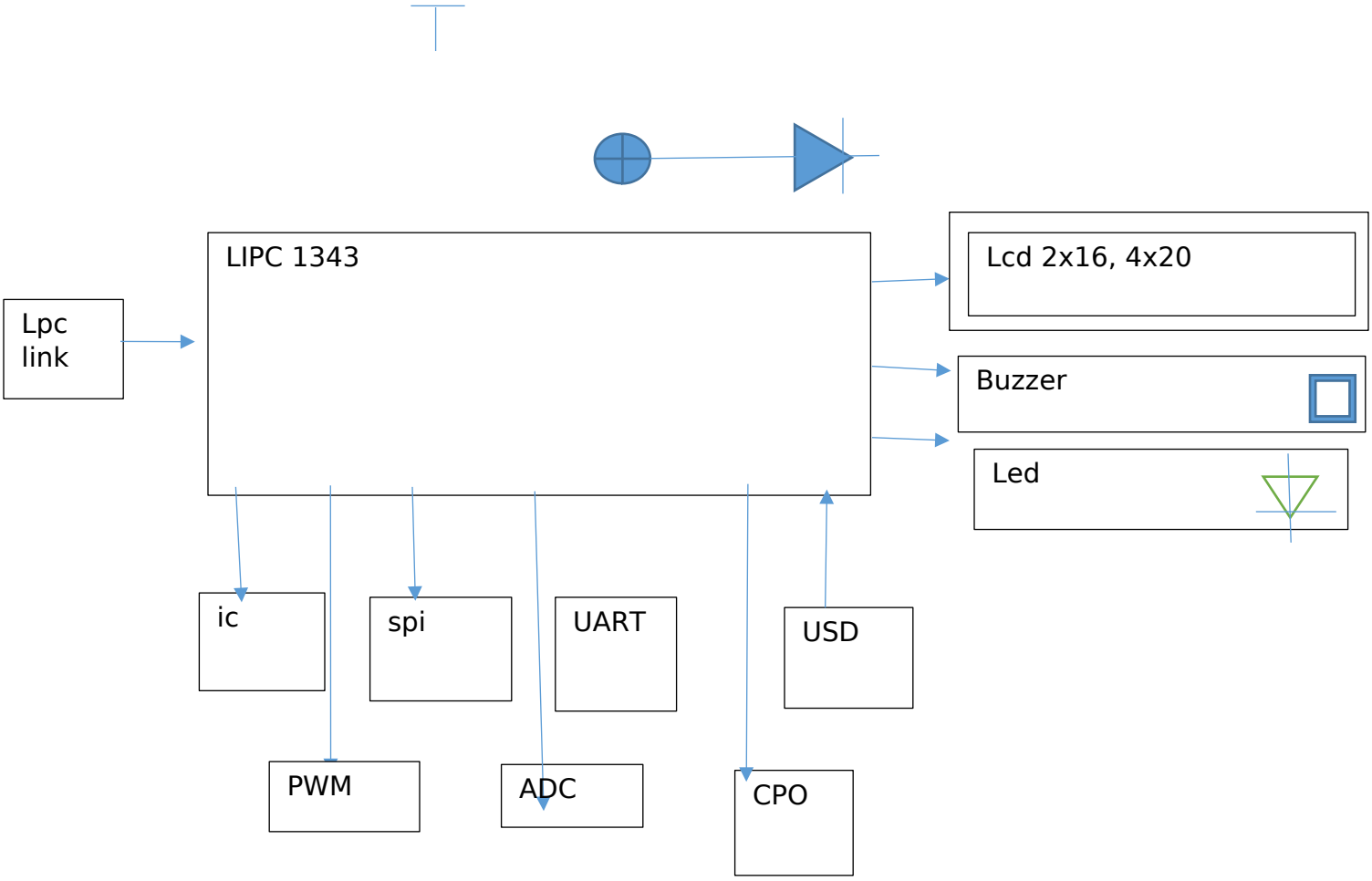
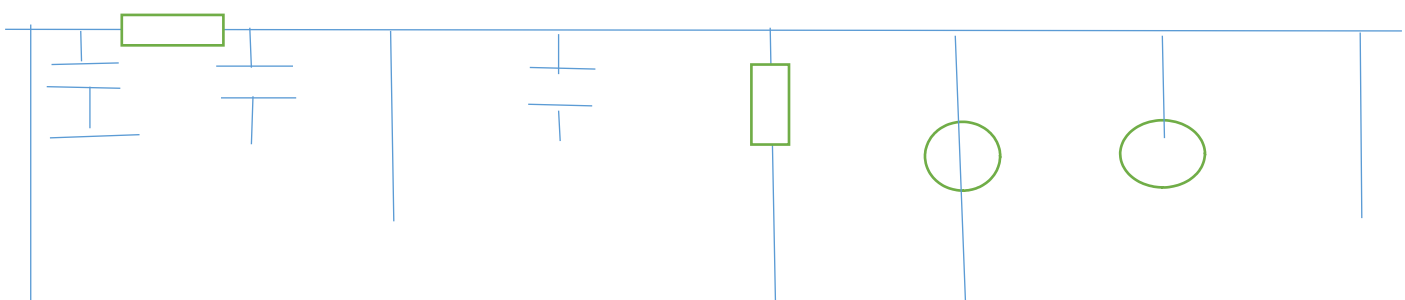
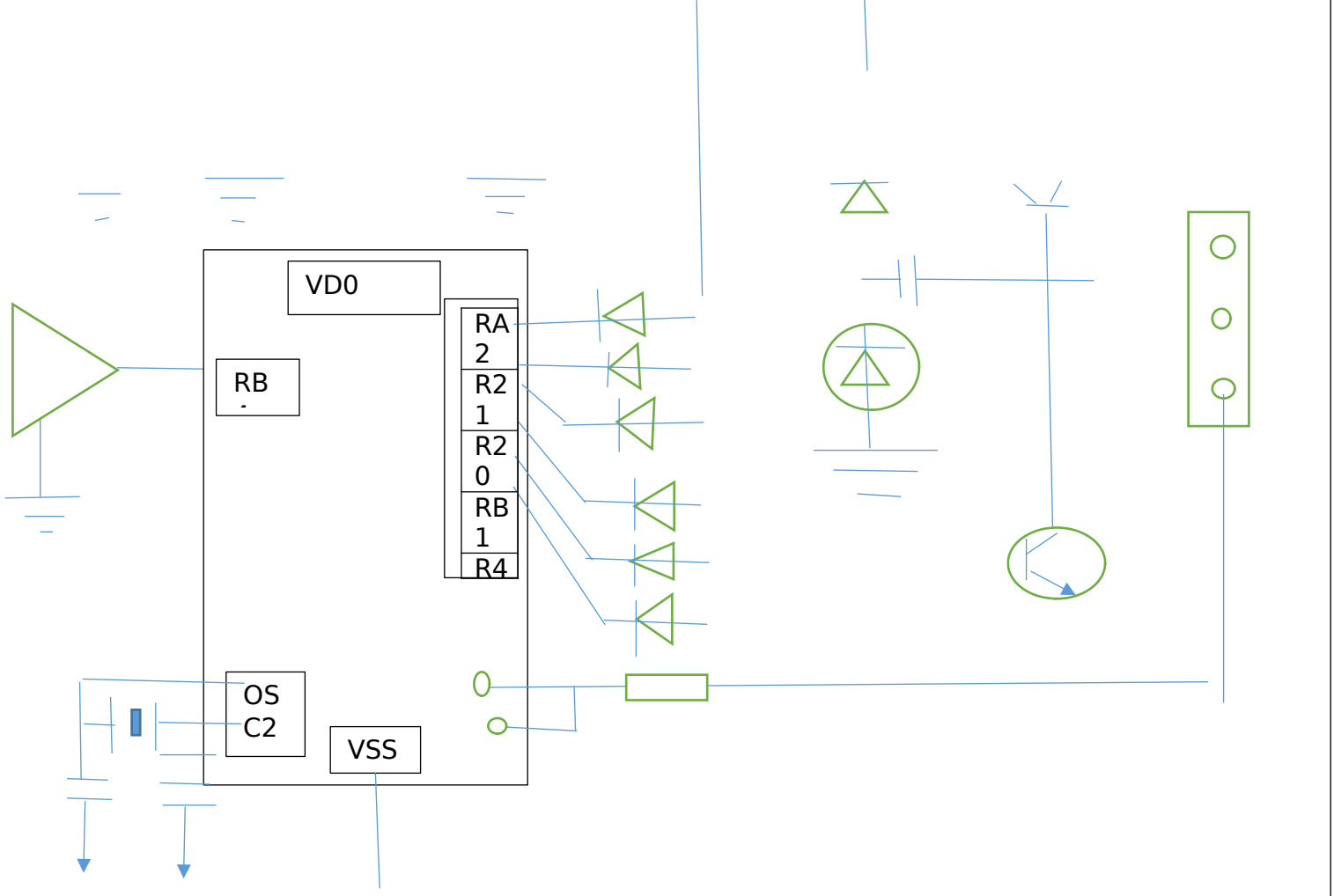

Lipo
change
5v boost
+3v3 LDO

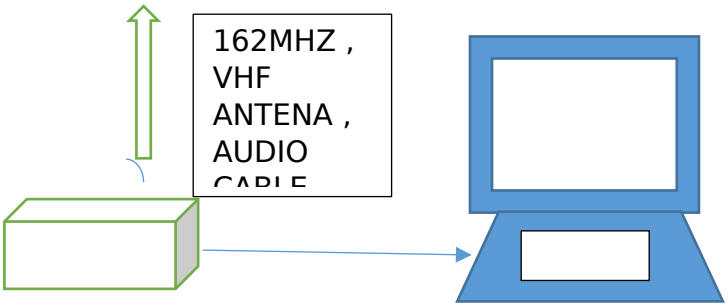


LCD DISPLAY 2X16, 4X16 SOFTWARD CONTROLLED 5X6 MATRIX ,KEY PAD MAXIMUM ENCODERS , 27 PUSH , USB , 5V, SUPORT. CELL (0,9-4,5 V) LIPO CONTROL MEASUREMENT , 48 , 32 BIT 48-PIN ,LPC , 32 BIT FLASH MEMO , 8KB

LR REMOTE LIGTH DIMER MODULE ,,// INTELLIGENT DIMMER , PK-PK,584V, RMS 11300,







NEW 2,5 M SOCKET FITTED TO SCANNER RECEIVER

VHF RECEI VER

SCANER RECEIVER BASIC BOARD AUDIO PIN 12

PIN 7-50/60HZ , GND 50

CMPSO, 03

1.8K

1.8K

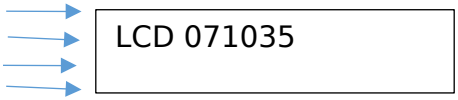
ATM 18

LCD DESIGNER

CLEAR

SET

OK



WIRING BLOCK DIAGRAMME :

Listing 2 storing custom charact ,

Address C G –ram a programmer

Char1: $40 a 97

Char 2 :$48 a $ 47f

Char #: $ 50 a $ 57

Sub lcd _ custom _ clear () ,rs+0

Custms 20

Waiting 20

Lcd _ write byte , &h40

Rs+1

Waitms 20

Def lcd char [0},31.24,25,25,27,31,31,31,32

Lcd_ write _byte 31 , $40

LCD_WRIT_BYTE 24 , $41

LCD _WRITE _ BYTE 25-

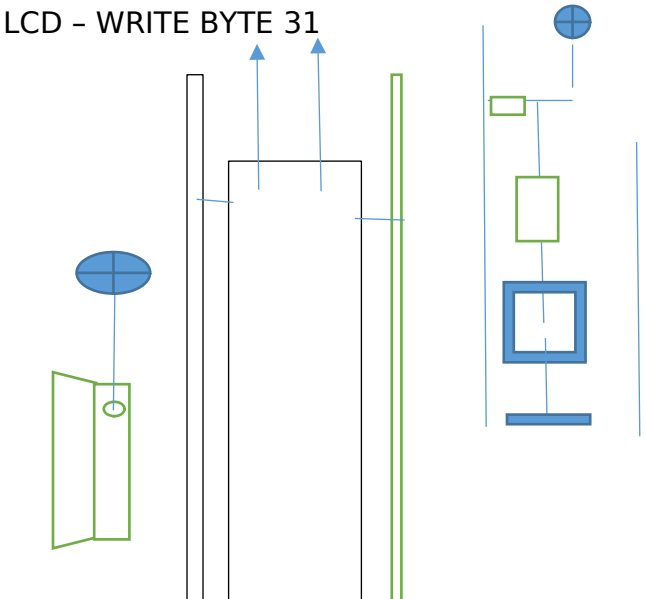
LCD – WRITE BYTE 31

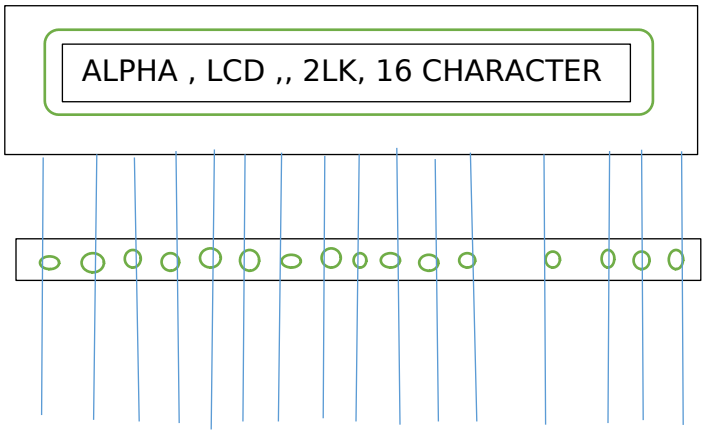
LCD WRITE –BYTE 31

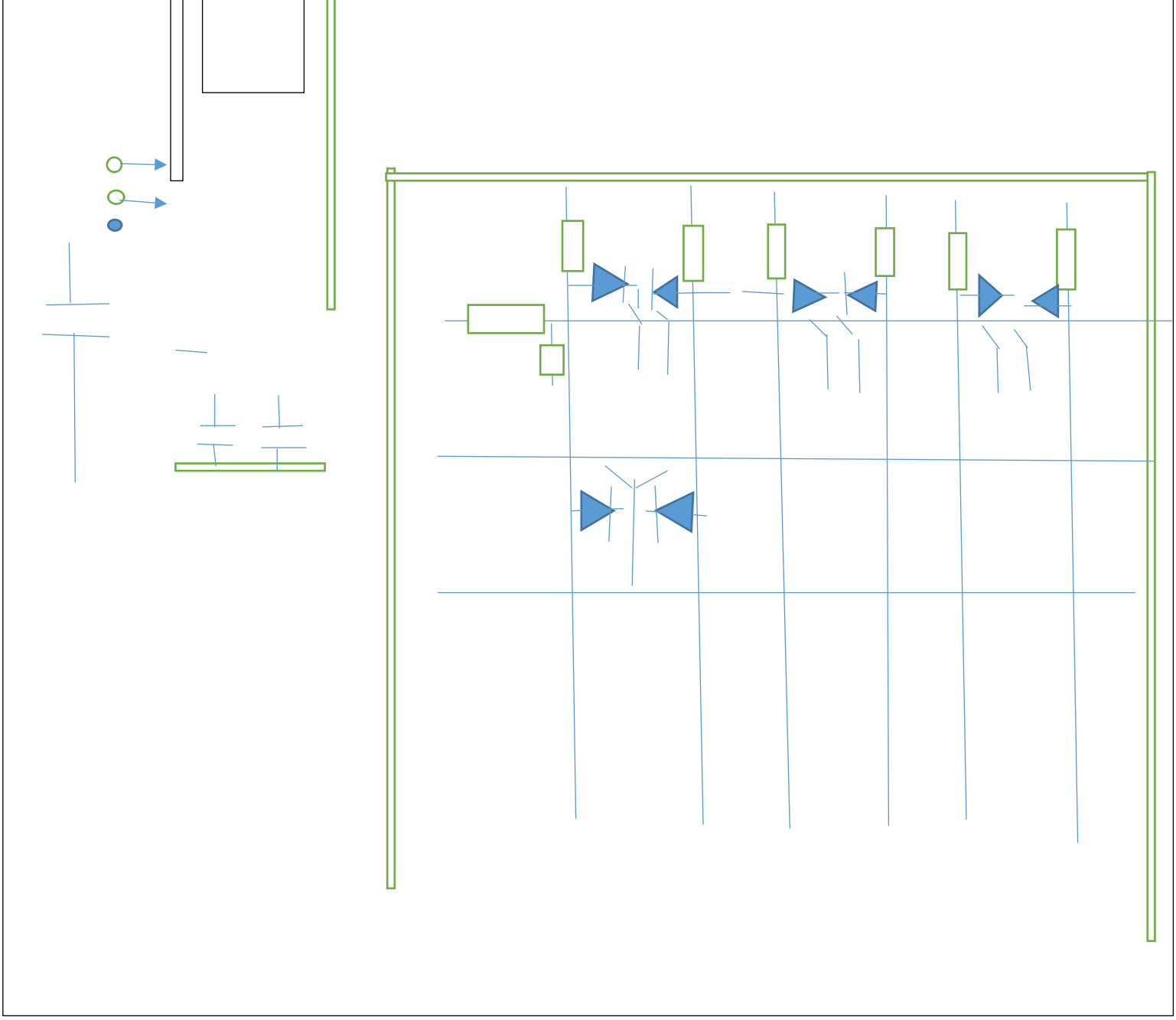
OUT PUTTING THE CUSTOMER CHAIR

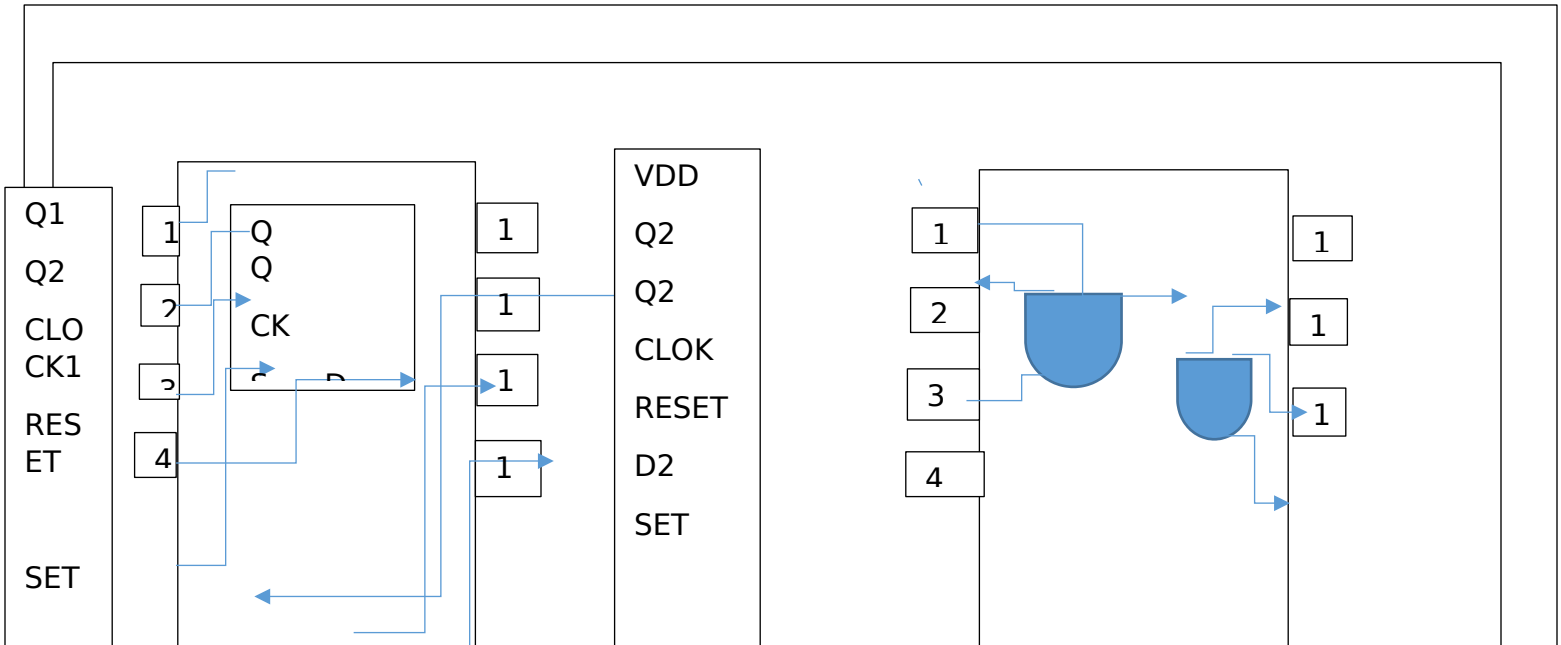
- SUB PAINTING (BY VAL DIRECTION ,
- AS STRING ,BY VAL X LCD AS BYTE SELECT CASE DIRECTION . CASE <<NINE>>
- RS+1 , ENVOI WQAITIN 20
- CASE << ENE ,, RS +1,, ENVOI ,,LCD _ WRITE _BYTE &H01

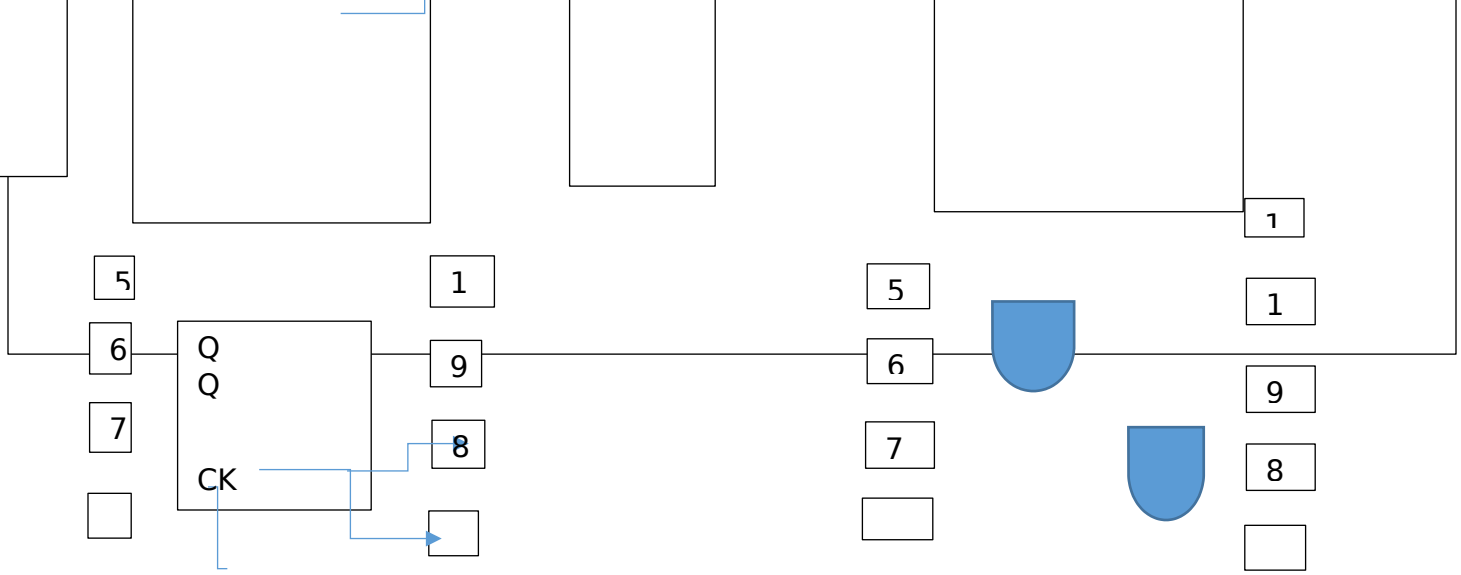
LCD – WRITE BYTE 31





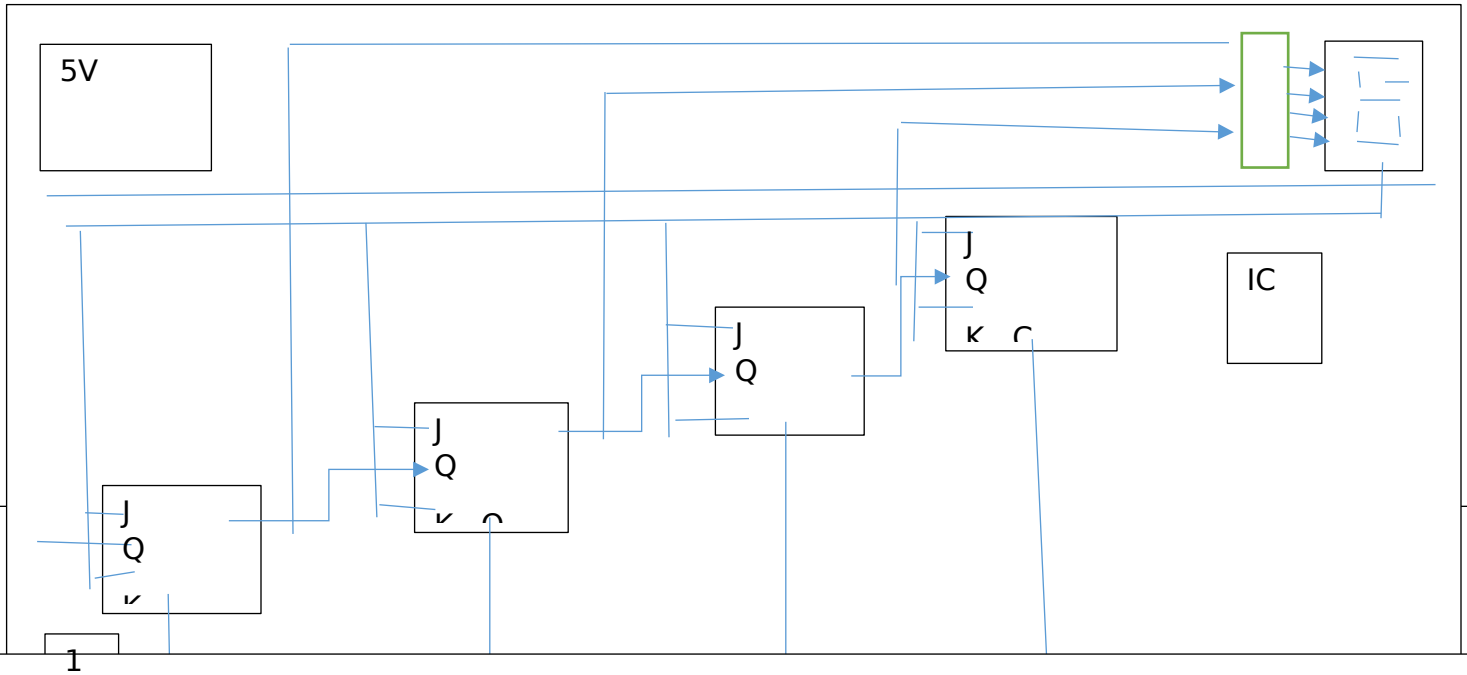


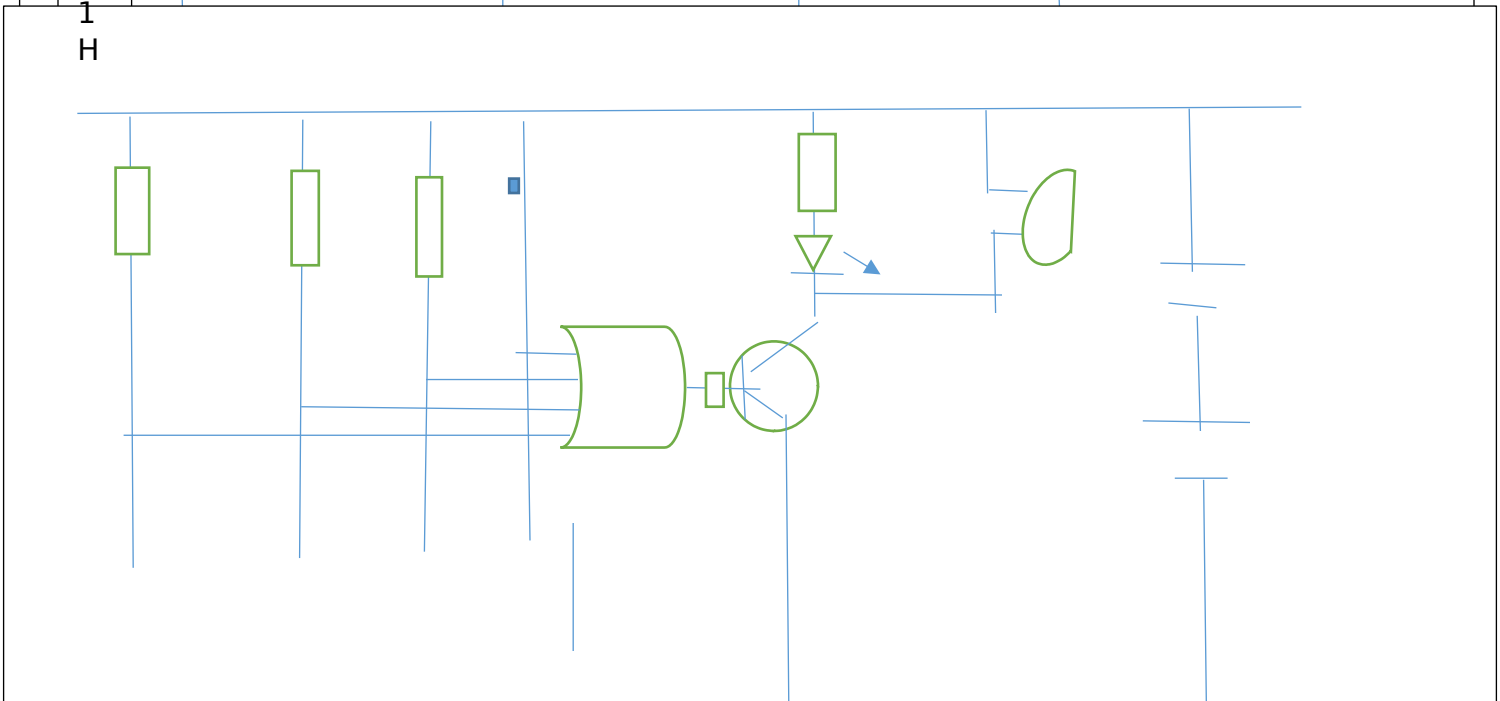

Q1
Q2
CLO
CK1
RES
ET
SET
1
2
4
Q
Q
CK
1
1
1
1
VDD
Q2
Q2
CLOK
RESET
D2
SET
1
2
3
4
1
1
1

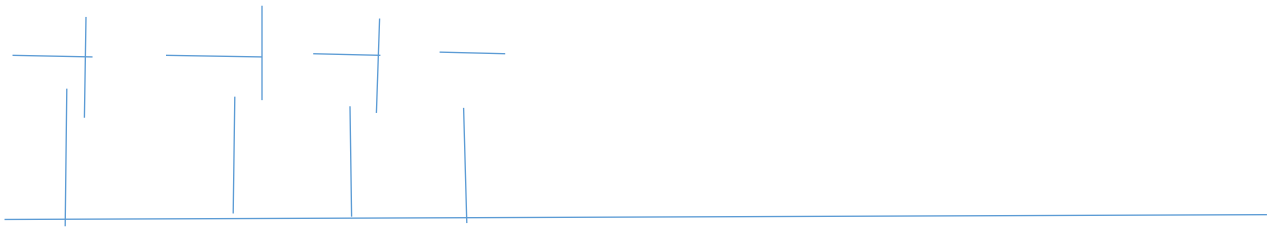


PIN CORRECT 4013

NAND







SW1,,
SW2,,SW3,,SW4,,,SW5,,LINK

ALARM

LABEL NUMBER

IC

OK

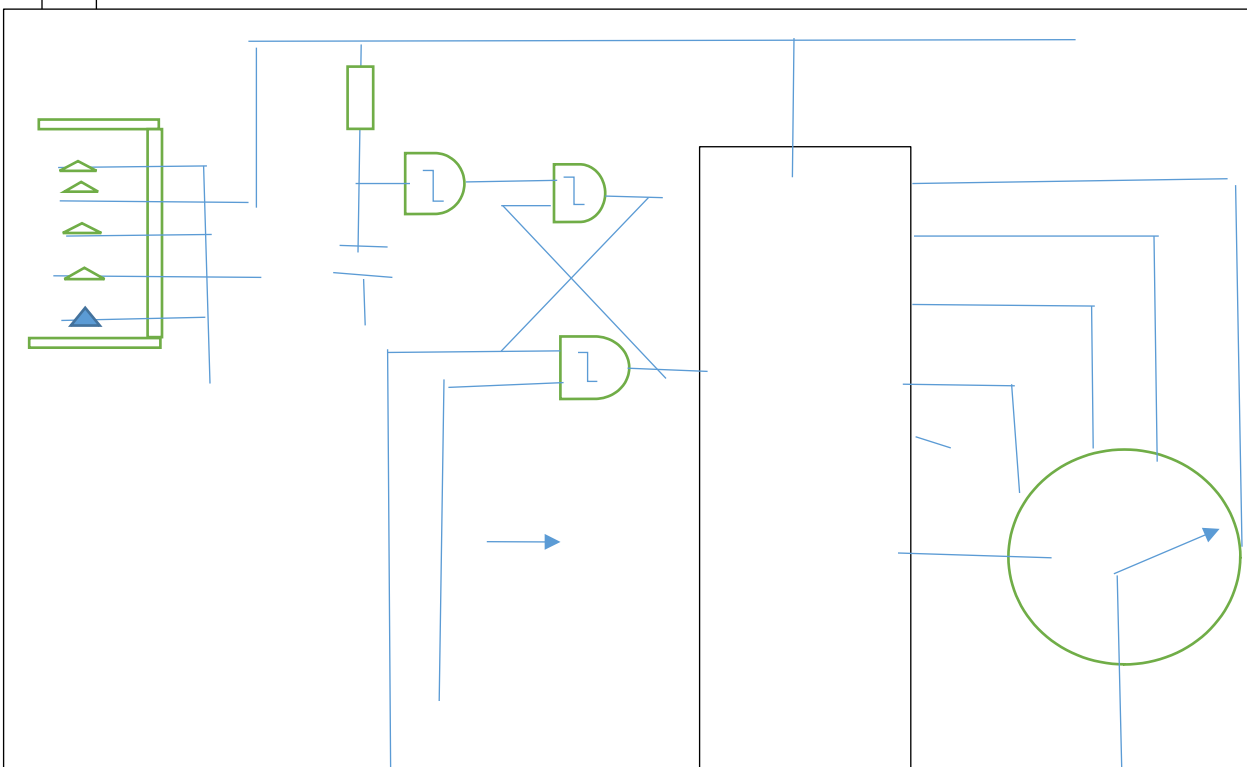
LABEL CAPTION

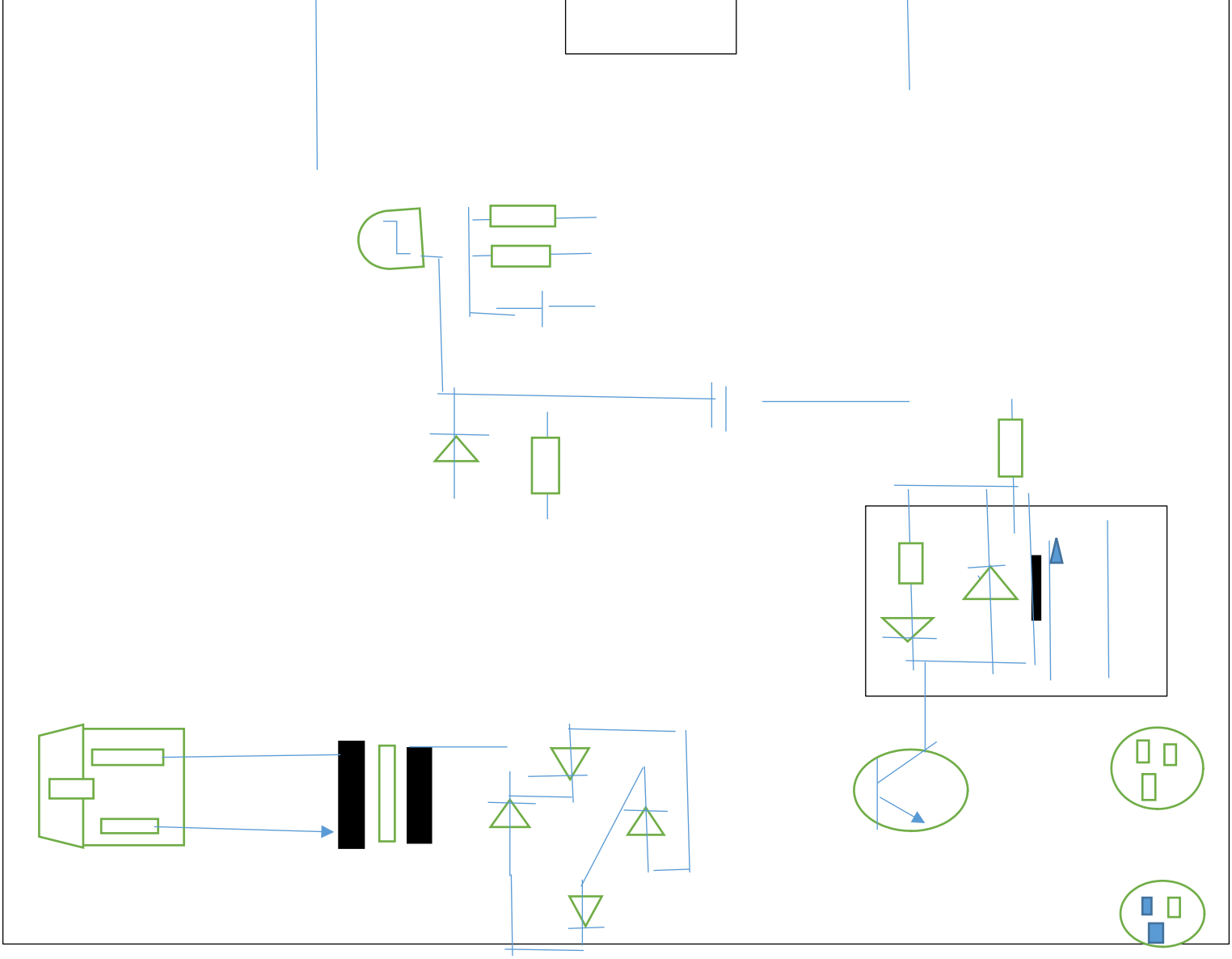
CANCEL

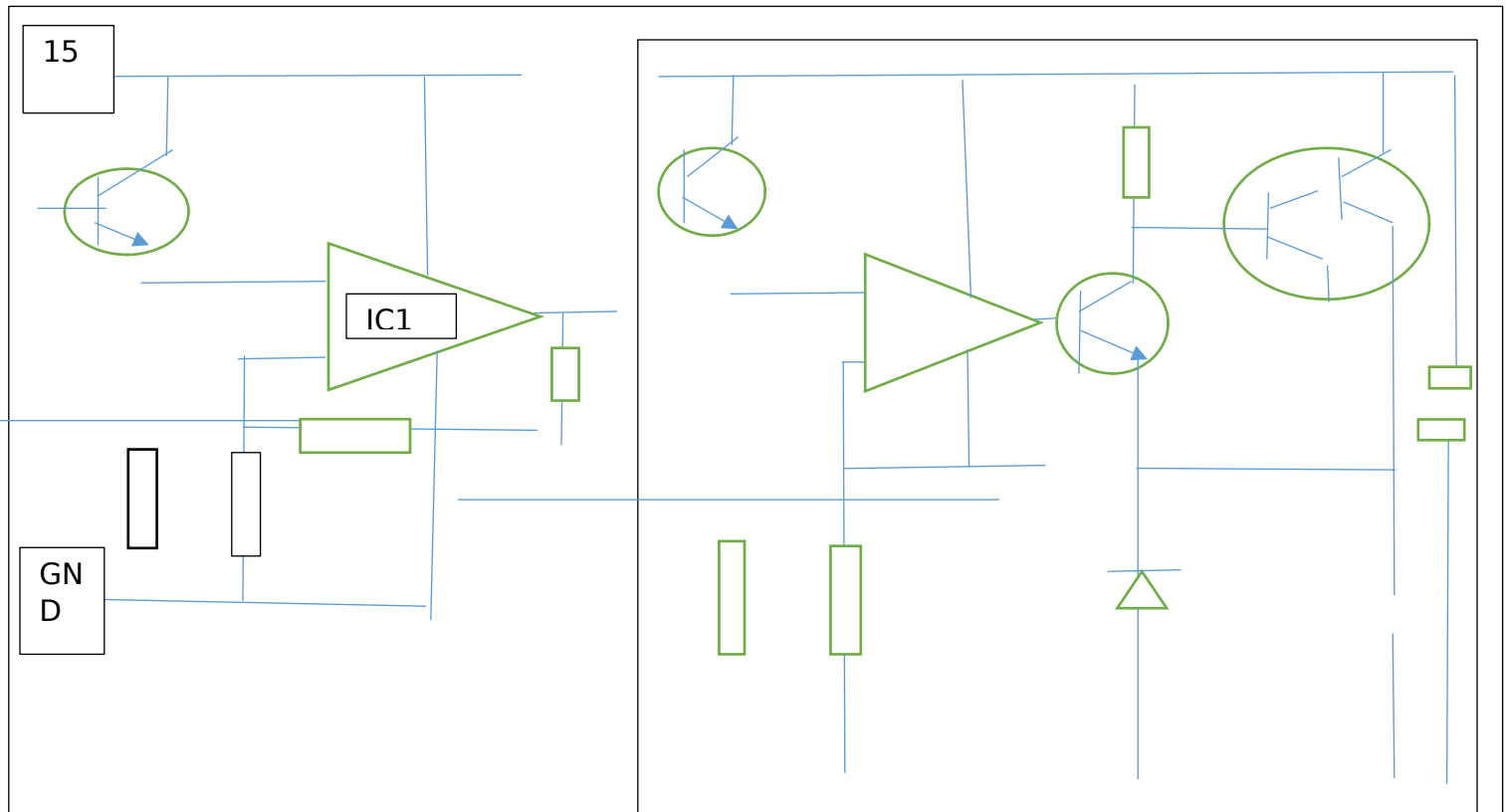
MODEL

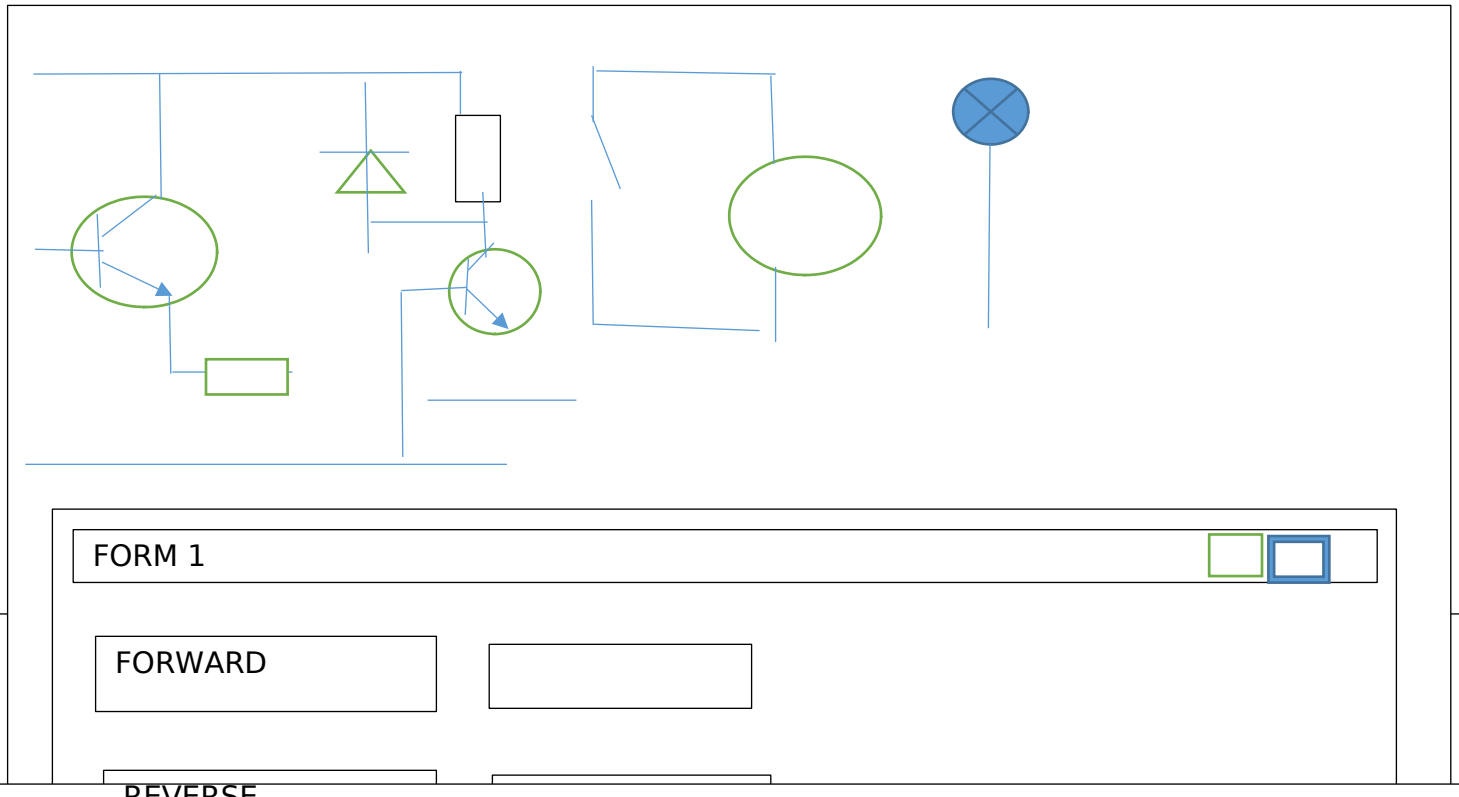
408IB QUAD

HELP






15
IC1
GN
D

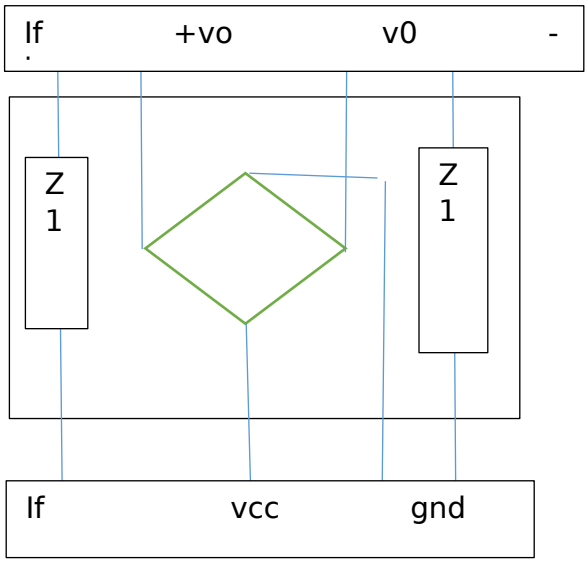


VB LABELL COMPONENT LABEL 2 SCROLLBAR MUST HAVE A MAXIMUM AND MINIMUM VALUE 2550 AND VALUE CONTROL COLOUR RGB VALUE FOR LABEL , DIM statement is used define new colour use back colour 254 of gray 8 bit resolution 8 bit accuracy the screen ,

- Signal processing conditioning max load courent voltage not zero ic1 dc motor controle

Lighting application

- Public class form1
- Private sub button 2_click
- By val sender as system.
- Object , by val e as system event args) handles button2. Click
- Label 1. Backcolor=color back
- End sub
- Private sub button 1_click by val sender as system. Object by val system
- Event args)handles button. Click
- Label1.back colour =color white
- End sub
- Private sub hscrol(bar 1_scrole, (byval snder as system. Object by val e as system
- Windows ,form scroll event arg , hanfles scroll
- Dim output val as colour + color from . arg b(hscroll bar 1, value h scroll bar value hscroll bar 1. Value label backcolor =output



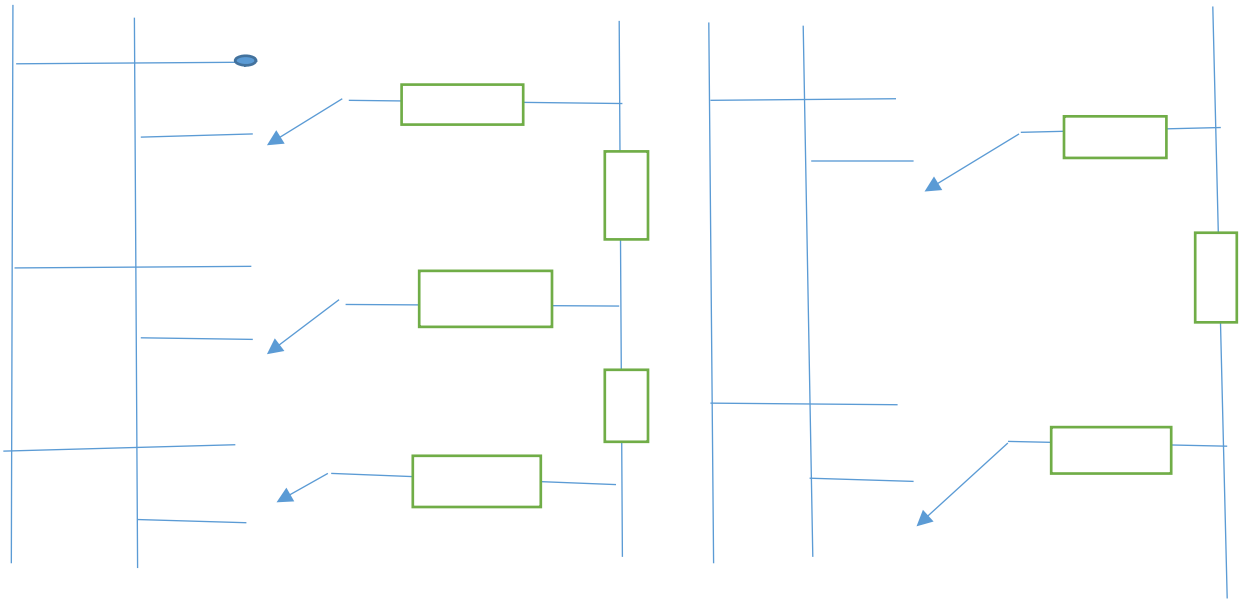
Function cmps 03 soft revision , ic2 start, i2 cwy byt cmps03_add write , i2 cw byte o, i2 crep start , I2 CRITE SOFT REVISION ,I2

END FUNCTION

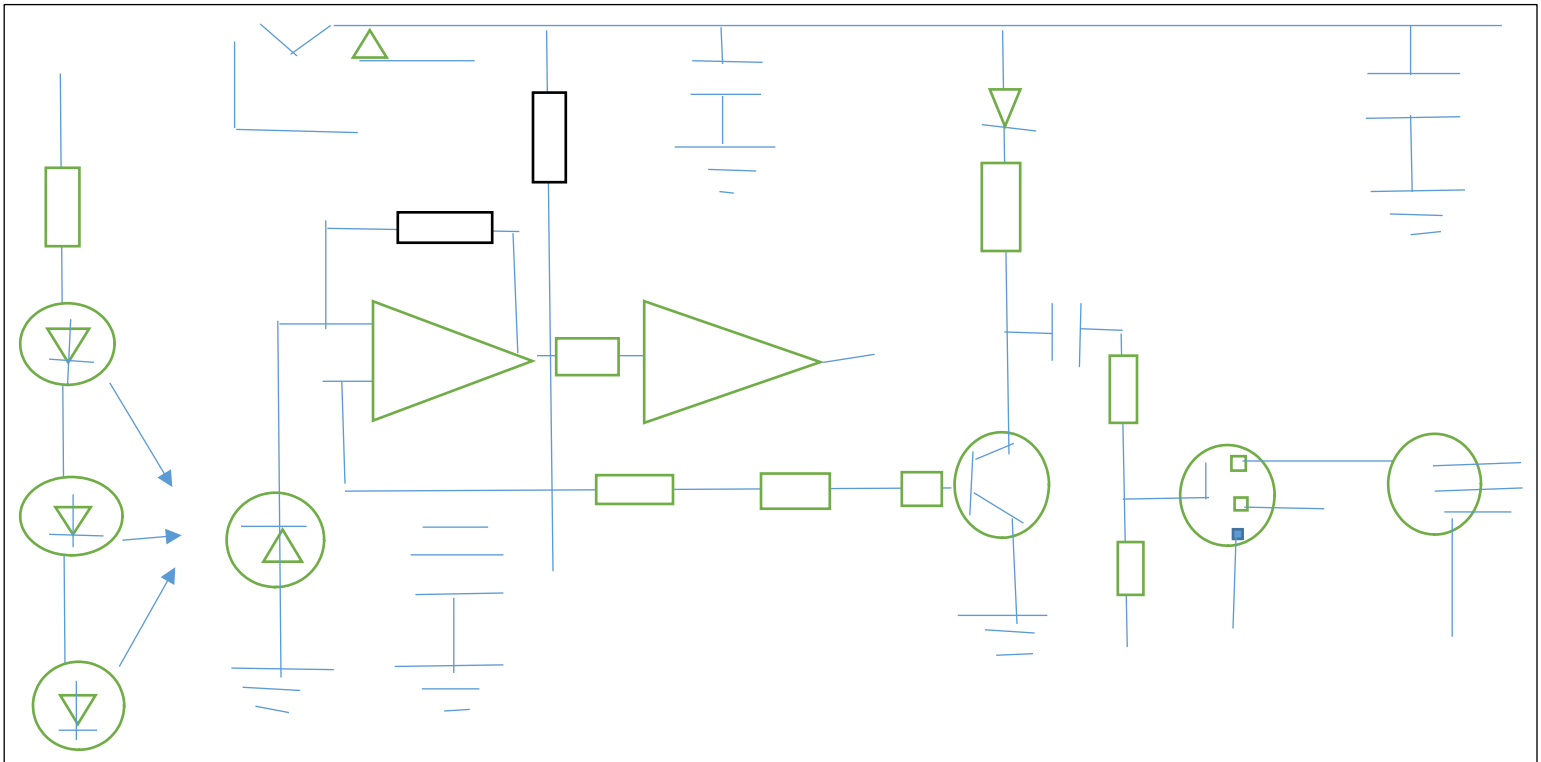
FUNCTION CMPS03 BEARING –BYTE () AS BYTE I2 START

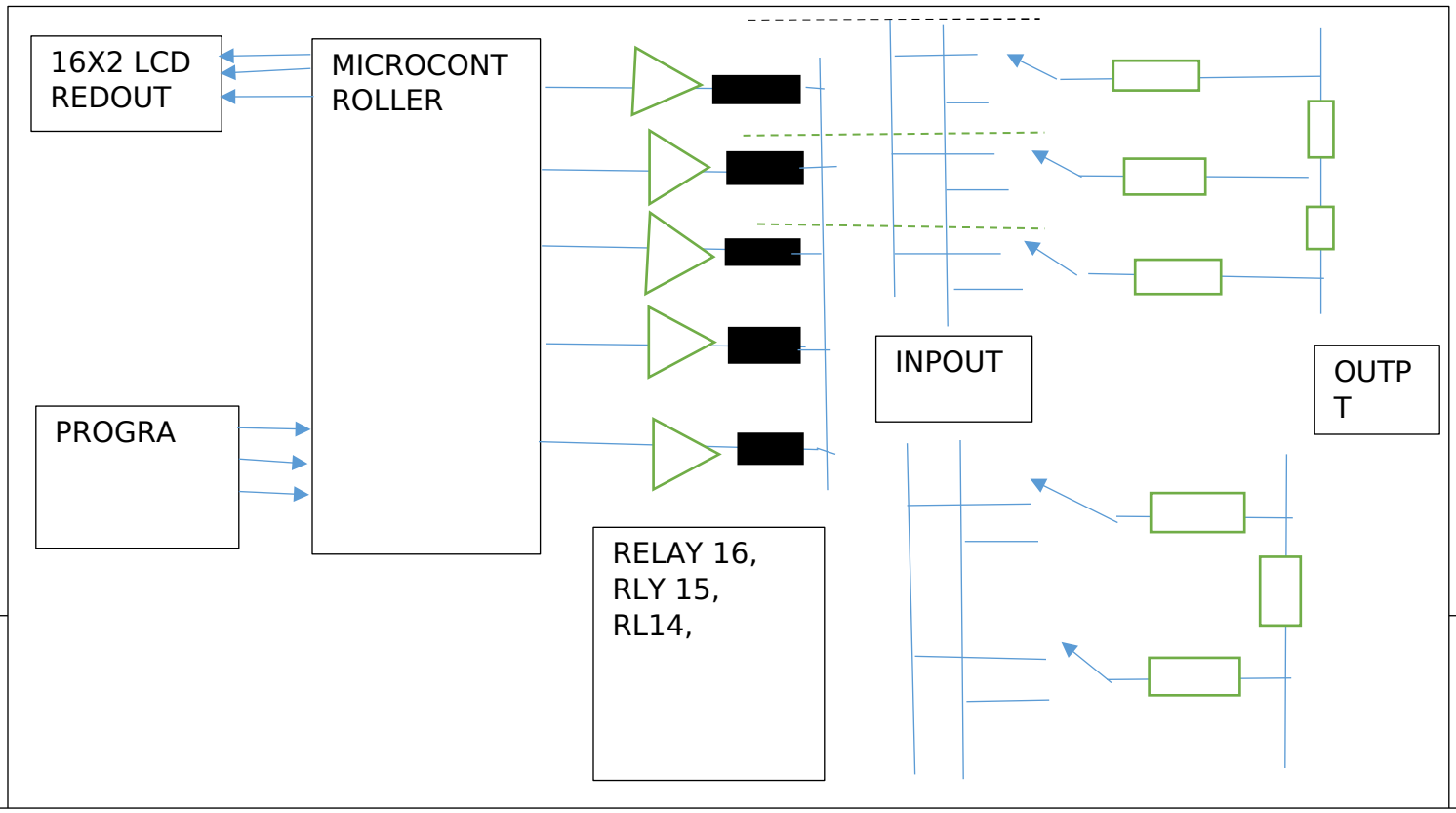
I2, CREPT START . CMPS 03 _ADD_RWITEN , I2 , I2 CSTOP

END FUNCTION CMPS03_03_ BEARING _ WORD () AS WORD , LOCAL HI BYTE AS BYTE , LOCAL LO BYTE AS BYTE , LOCAL AS BYTE, I2 CSTART , I2 RESTART



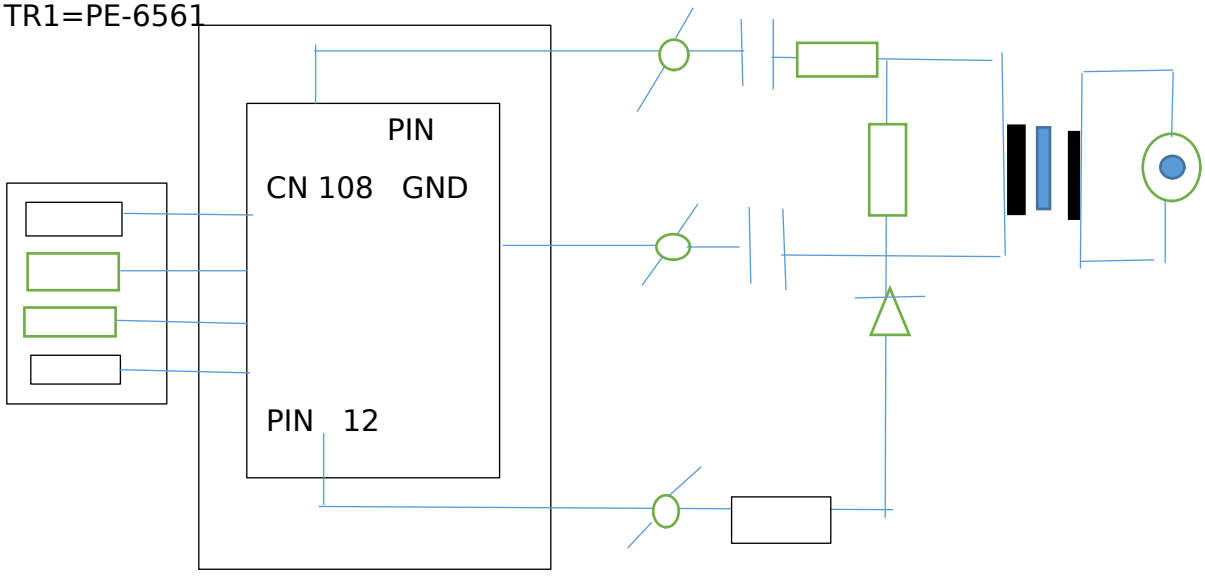
NETWORK SW LOAD

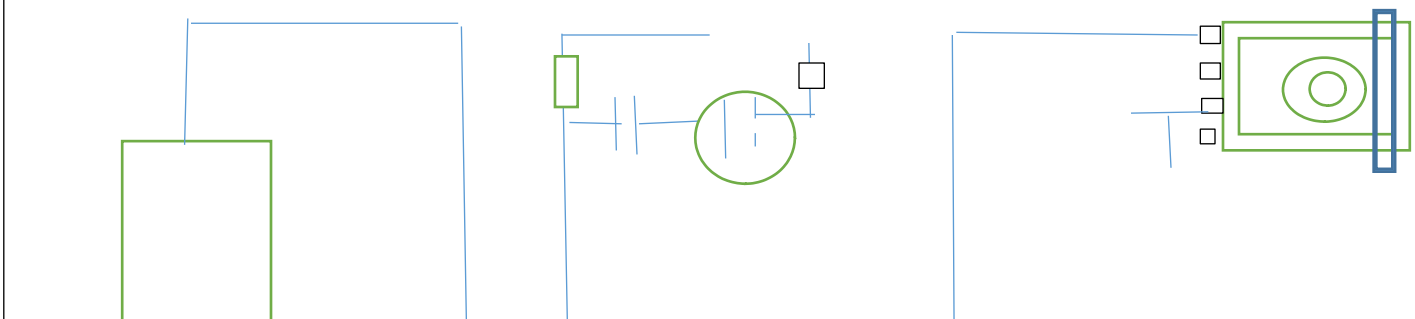


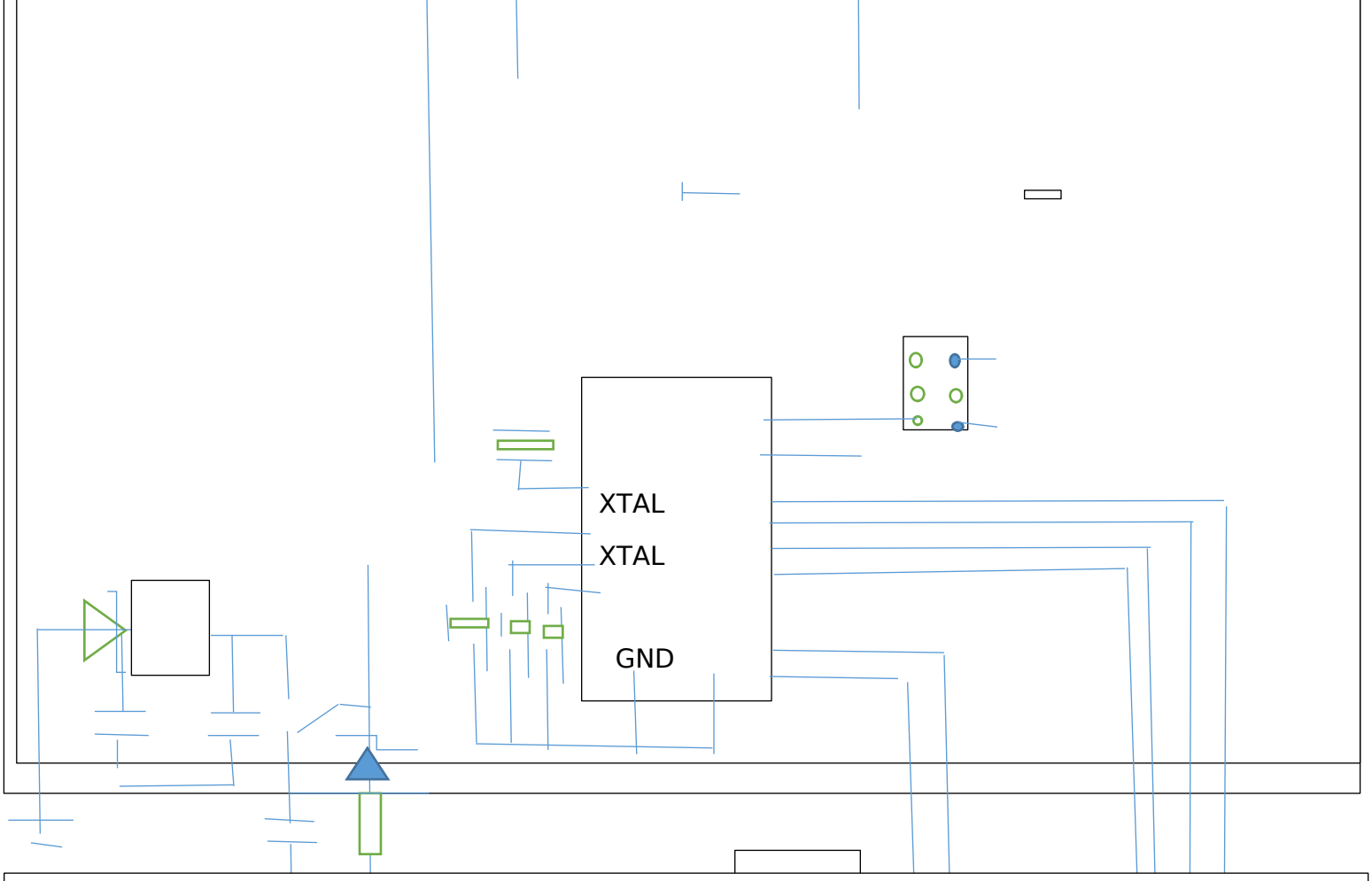


MICROCONTROL TEST MEASUREMENT , ATM 18/CMPS 03,

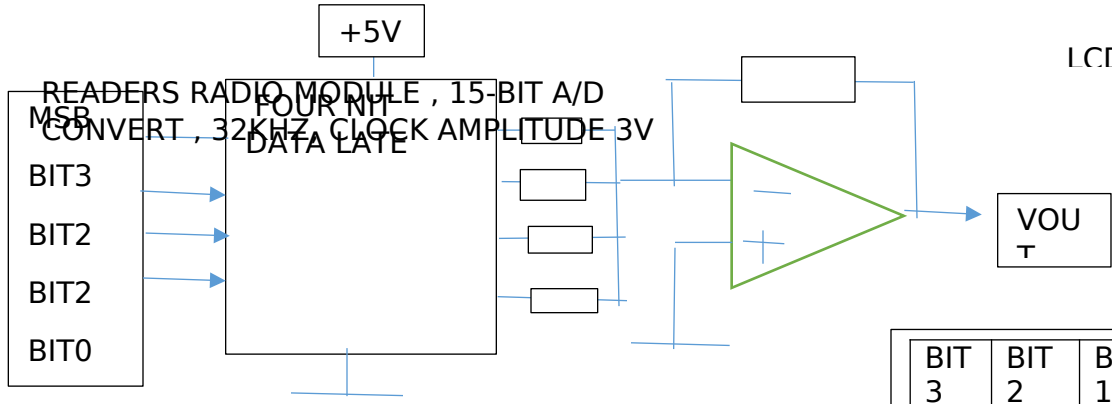
LAB TESTING , RESITOR R=330 OHM , R2=680 OHM , CAPACITOR C1=1000NF, INDUCTOR TR1=PE-6561



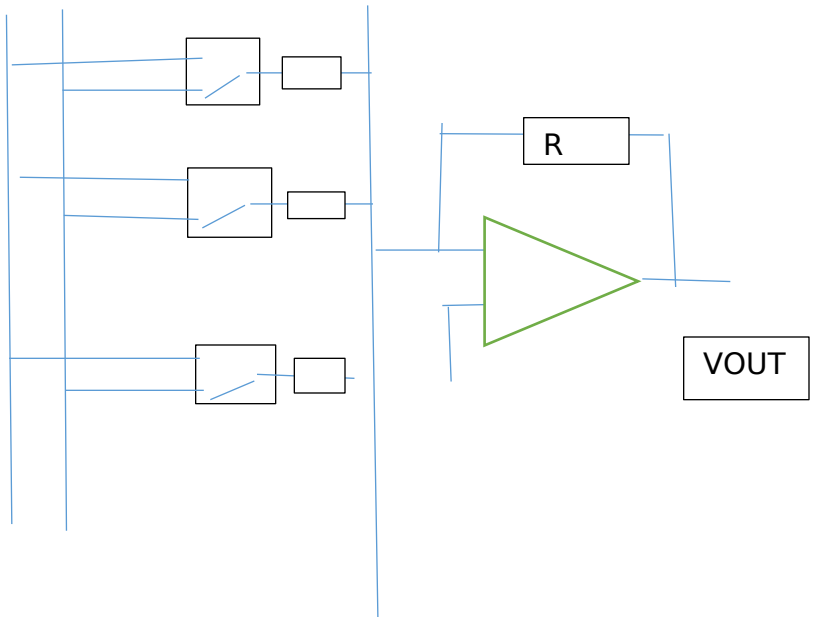




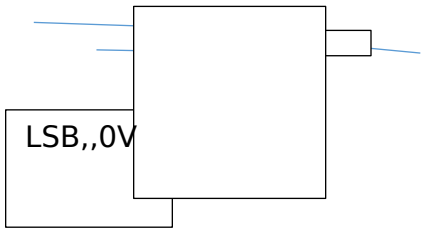
BINARY WEIGTHTED DAC

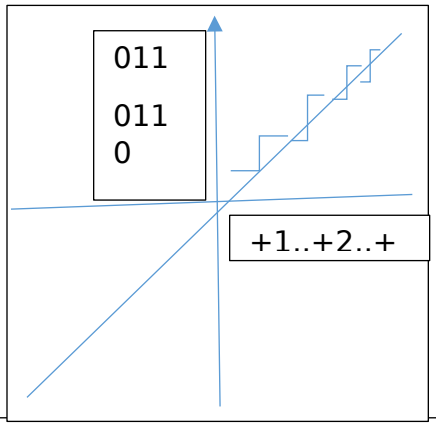


LCD 16X2

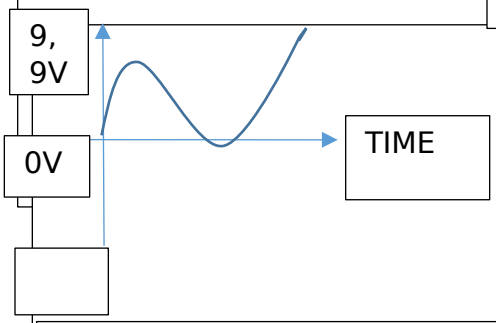


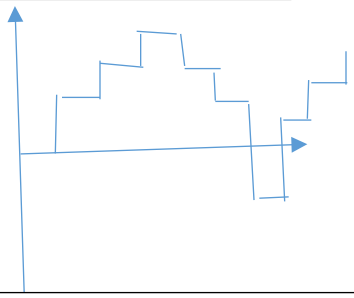
BIT 3	BIT 2	BIT 1	BIT 0	OUTPUT V0	
0	0	0	0	0V	
0	0	0	1	-0,625V	
0	0	1	0		
0	0	1	1		
0	1	0	0		
0	1	0	1		
0 0 0 0 1 1 1 1 1 1	1 1 1 1 0 0 1 1 1 1	0 0 1 1 0 1 0 1 1 1	1 0 1 1 1 1 0 1 1 1		

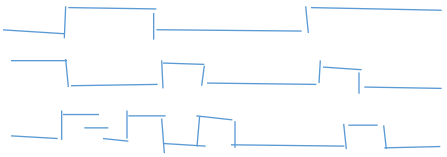


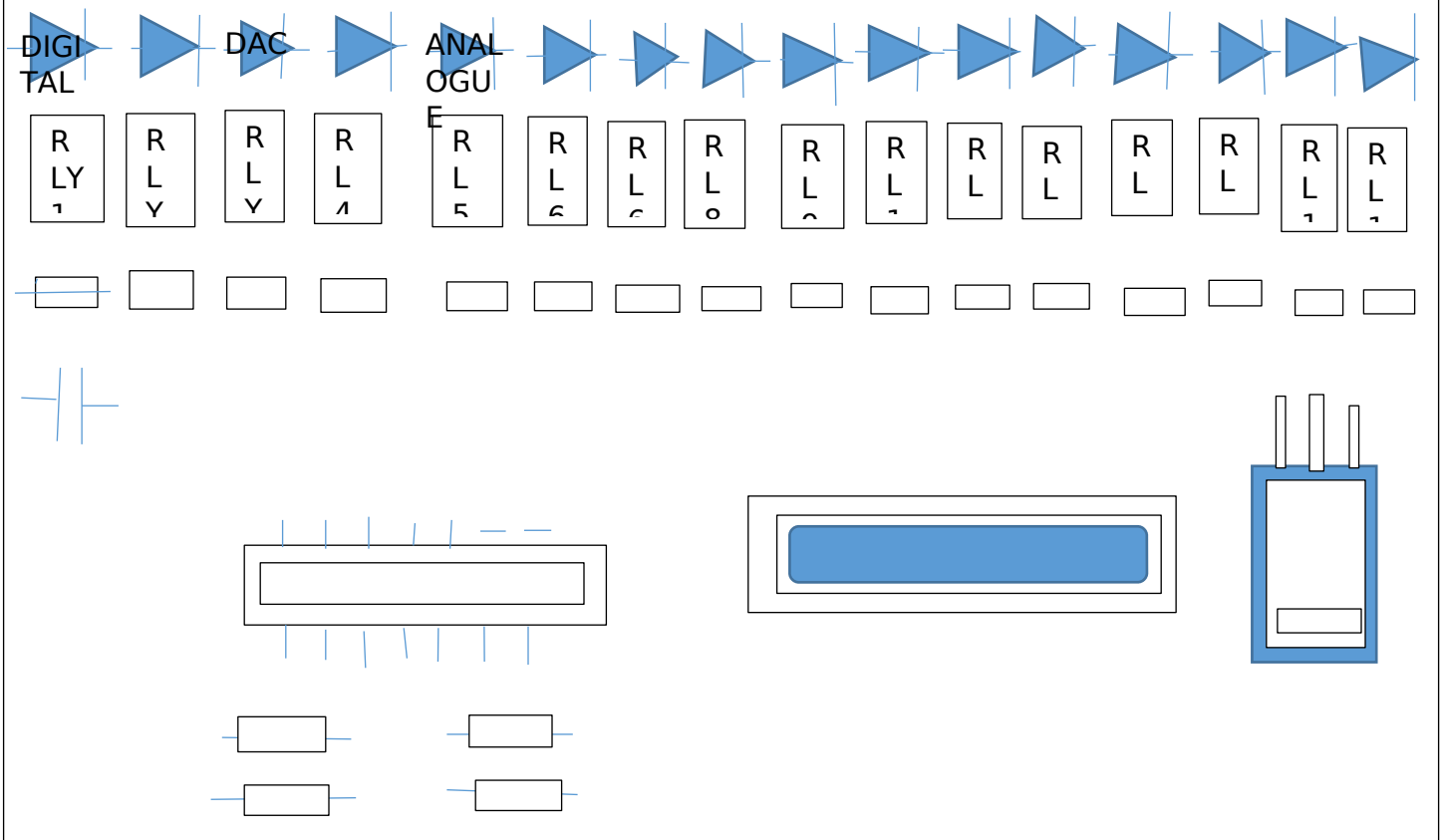


BIT	VOLTAGE AGAIN
3MSB	-R/R=1
2	-R/2R=-0,5
1	-4/4R=0,25
0LSB	

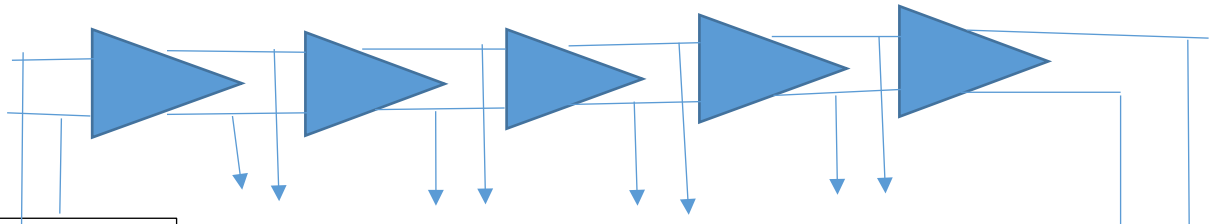








LCD MODULE IS MOUNTED TWO M3X 15 MM , 16 WAY



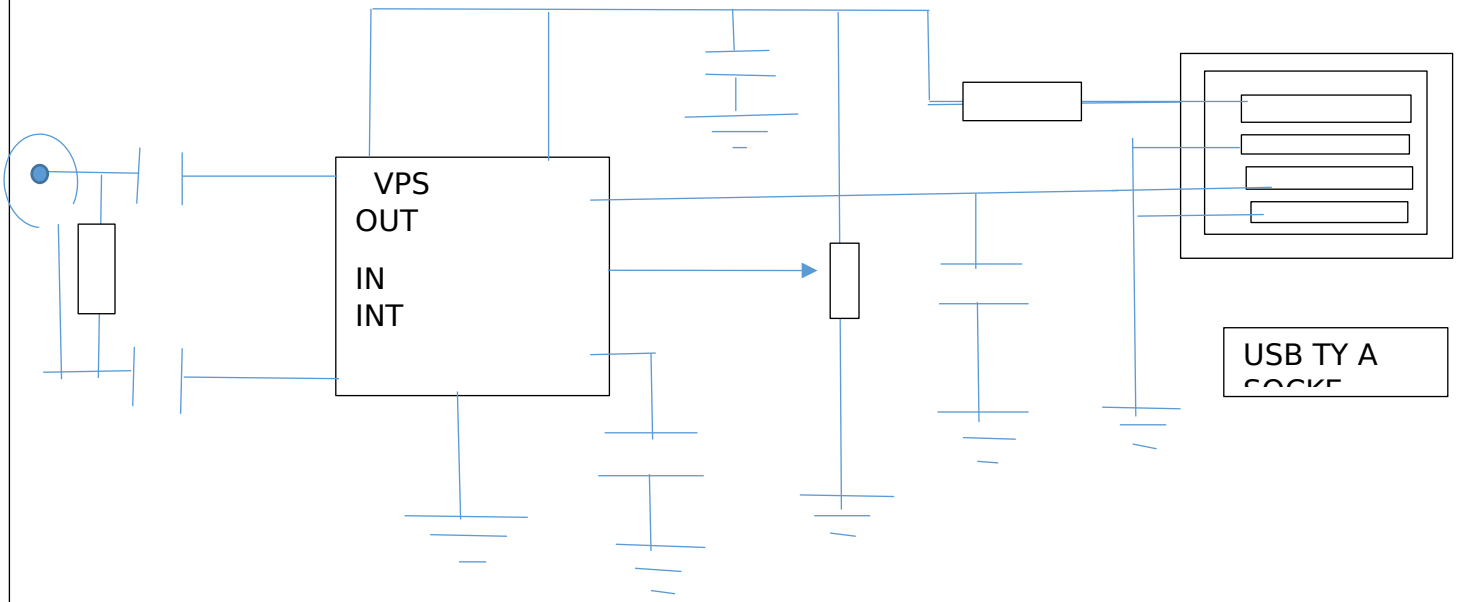
3 PASSIVE ATTENUAT OR CELLS

NINE FULL WAVE DETECTOR DIFFERENTIAL OUTPUT

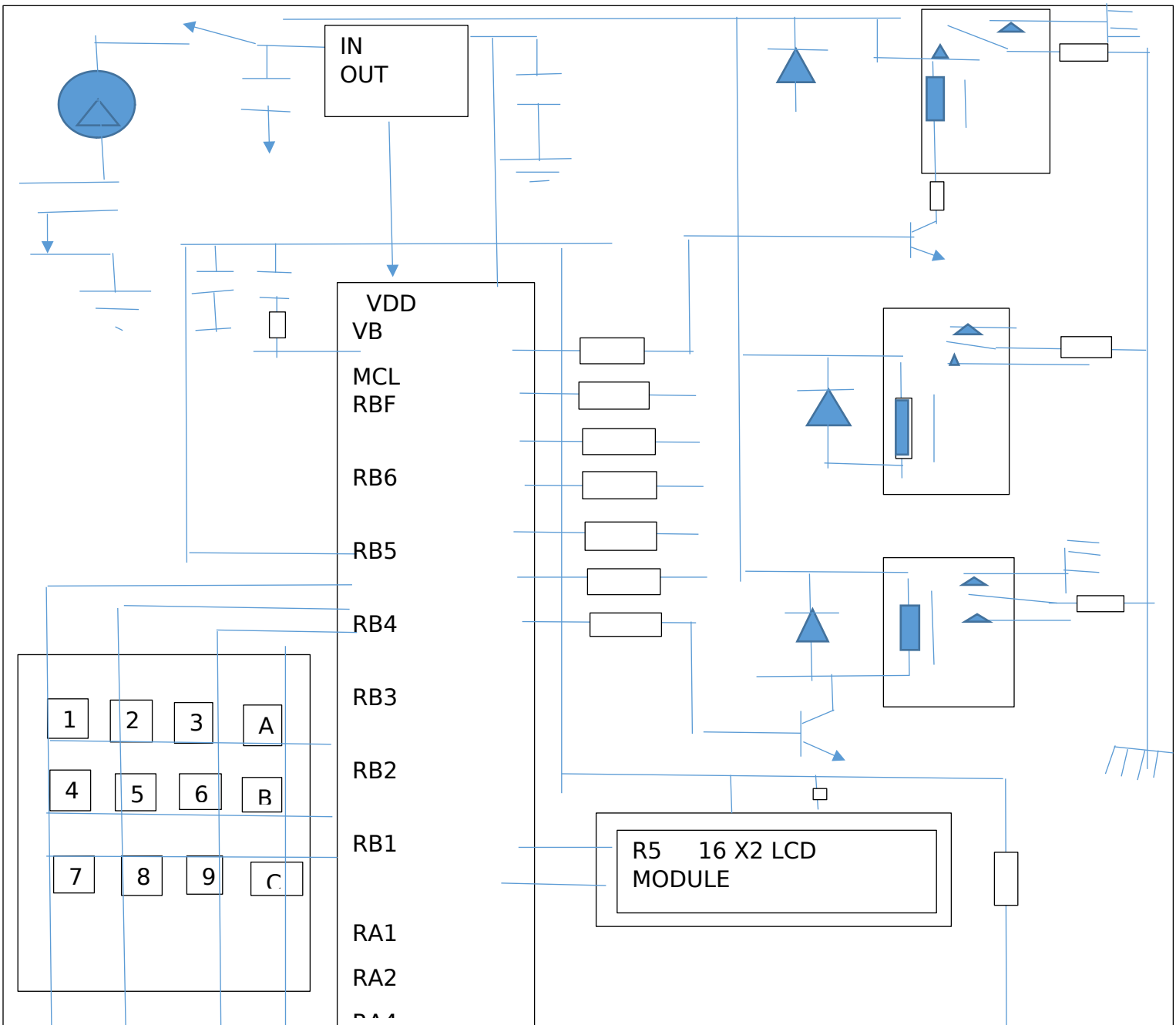
MIRROR

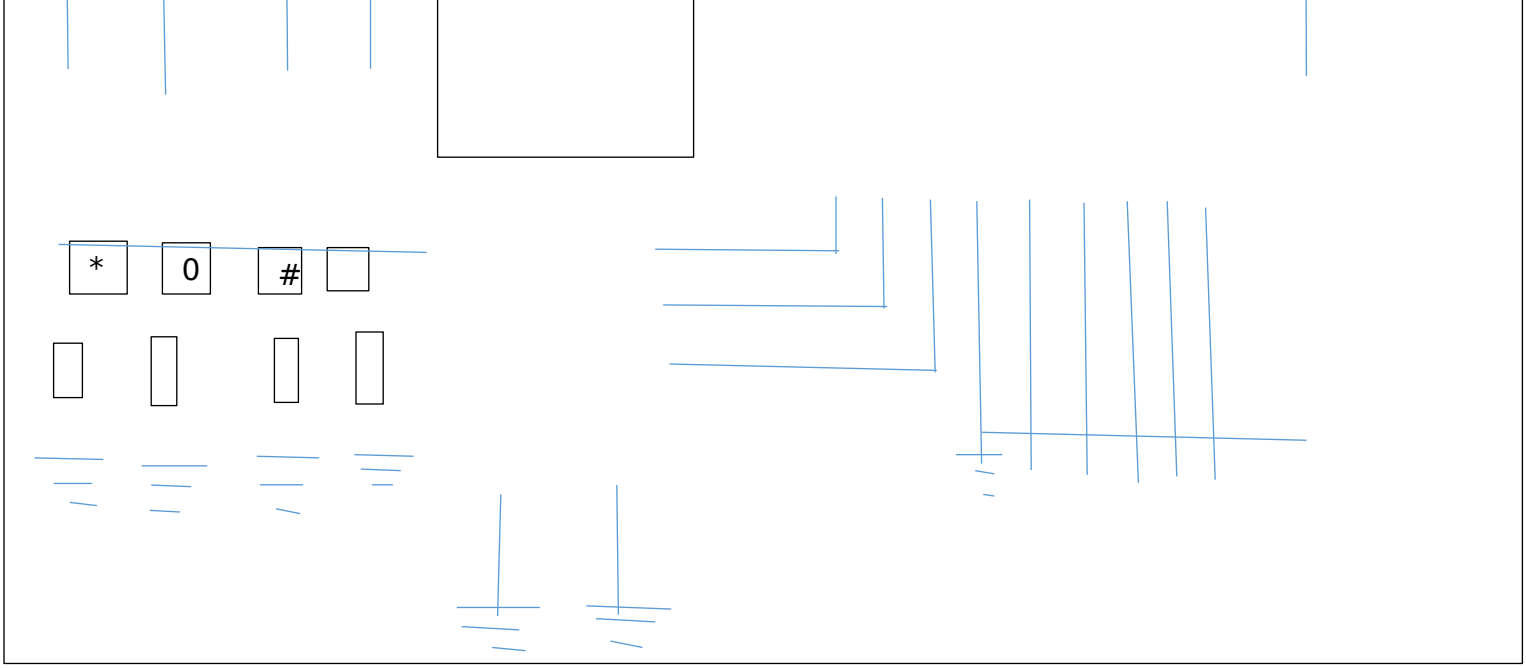
BAND CAP REFERENCE

INPUT OFFSET COMPOSE LOOP



RF LEVEL BASE DETECT OUTPUT PIN 4


IN
OUT
VDD
VB
MCL
RBF
RB6
RB5
RB4
RB3
RB2
RB1
RA1
RA2
1
2
3
A
4
5
6
B
7
8
9
C
R5
16 X2 LCD
MODULE


*
0
#

Tshingombe, this is a rich and multi-layered technical sketch—almost like a hybrid between a Visual Basic UI logic diagram, embedded systems wiring plan, and signal conditioning control sheet. Let me help you structure and interpret it modularly so it aligns with your architectural style and supports audit-ready documentation.

□ VISUAL BASIC UI LOGIC: RGB Scroll-Controlled Label

□ Objective

Create a Visual Basic Form with:

- Two buttons to toggle label background color.
- A horizontal scrollbar to control RGB values dynamically.
- Label2 displays color feedback based on scrollbar values.

□ Core Components

```
Public Class Form1
    ' Scrollbar range: 0 to 2550 (8-bit resolution per channel)
    Private Sub Form1_Load(sender As Object, e As EventArgs) Handles
MyBase.Load
        HScrollBar1.Minimum = 0
        HScrollBar1.Maximum = 2550
    End Sub

    ' Button1: Set label to white
```

```
    Private Sub Button1_Click(sender As Object, e As EventArgs) Handles
Button1.Click
        Label1.BackColor = Color.White
    End Sub

    ' Button2: Set label to gray (value 254)
    Private Sub Button2_Click(sender As Object, e As EventArgs) Handles
Button2.Click
        Label1.BackColor = Color.FromArgb(254, 254, 254)
    End Sub

    ' ScrollBar: Adjust RGB dynamically
    Private Sub HScrollBar1_Scroll(sender As Object, e As ScrollEventArgs)
Handles HScrollBar1.Scroll
        Dim val As Integer = HScrollBar1.Value \ 10 ' Normalize to 0–255
        Dim outputColor As Color = Color.FromArgb(val, val, val)
        Label2.BackColor = outputColor
    End Sub
End Class
```

⚙ SIGNAL CONDITIONING + MICROCONTROL

🔌 DC Motor Control Block

- **IC1**: Motor driver
- **Voltage/Current**: Must be non-zero
- **Application**: Lighting control, load conditioning

🧭 CMPS03 Compass Interface (I²C)

```
Function CMPS03_SoftRevision() As Byte
    ' I2C write/read sequence for soft revision
End Function

Function CMPS03_Bearing_Byte() As Byte
    ' Returns bearing as byte
End Function

Function CMPS03_Bearing_Word() As Word
    ' Returns bearing as word (hi/lo byte)
End Function
```

🧪 LAB TESTING COMPONENTS

Component	Value

LAB TESTING COMPONENTS

Component	Value
Resistor R1	330 Ω
Resistor R2	680 Ω
Capacitor C1	1000 nF
Inductor TR1	PE-6561

BINARY WEIGHTED DAC

Bits	Output Voltage
0000	0 V
0001	-0.625 V
0010	-1.25 V
0011	-1.875 V
...	...

- **Weighting**:
  - Bit3: -R/R = -1
  - Bit2: -R/2R = -0.5
  - Bit1: -R/4R = -0.25
  - Bit0: LSB

LCD + KEYPAD MODULE

- **Display**: 2x16 or 4x16, 5x6 matrix
- **Custom Characters**: Stored in CG-RAM
- **Control**: RS, EN, WaitMS
- **Keypad**: 27 push encoders

- **Power**: USB 5V, LiPo 0.9–4.5V

🔌 LCD Wiring Snippet

```
Sub LCD_Custom_Clear()
    LCD_WriteByte(&H40)
    WaitMS(20)
End Sub

Def LCD_Char(0) = {31, 24, 25, 25, 27, 31, 31, 31}
```

🧩 BLOCK DIAGRAM ELEMENTS

- **Relays**: RLY1–RLY16
- **Diodes**: D1–D9
- **Reader Module**: 15-bit ADC, 32kHz clock, 3V amplitude
- **Model**: 408 IB QUAD
- **Mounting**: 2x M3x15mm, 16-way

📘 Modular Audit-Ready Documentation Blueprint

1. Title Page

- **Document Name**: *Visual Basic UI + Embedded Systems Integration Framework*
- **Author**: Tshingombe Tshitadi Fiston
- **Scope**: RGB UI logic, DAC signal conditioning, LCD interfacing, I²C compass integration, and lab-grade component mapping
- **Version**: 1.0
- **Compliance Tags**: SAQA/NQF, PSIRA, SAPS, HR, CCMA, Labour

2. Section A: Visual Basic UI Logic

🎛️ RGB Scroll-Controlled Label

- **Form Controls**: `Label1`, `Label2`, `Button1`, `Button2`, `HScrollBar1`

- **Resolution**: 8-bit (0–255), scaled from 0–2550
- **Code Block**: Fully documented with event handlers and color logic
- **Audit Notes**: Scroll normalization, color feedback, UI responsiveness

3. Section B: Embedded Signal Conditioning

Binary Weighted DAC

- **Bit Mapping**: BIT3 to BIT0
- **Voltage Equation**: $VOUT=(−1×VBIT3)+(−0.5×VBIT2)+(−0.25×VBIT1)+(LSB)V_{OUT} = (-1 \times V_{BIT3}) + (-0.5 \times V_{BIT2}) + (-0.25 \times V_{BIT1}) + (LSB)$
- **Example**: `0110` → BIT3=0, BIT2=1, BIT1=1, BIT0=0 → $VOUT=−0.5−0.25=−0.75VV_{OUT} = -0.5 - 0.25 = -0.75V$
- **DAC Type**: Passive attenuator cell, full-wave detector, differential mirror, bandgap reference

4. Section C: CMPS03 Compass I²C Interface

Functions

- `CMPS03_SoftRevision()`
- `CMPS03_Bearing_Byte()`
- `CMPS03_Bearing_Word()`
- **Protocol**: I²C start → write → read → stop
- **Audit Tags**: Byte/Word resolution, restart logic, address mapping

5. Section D: LCD + Keypad Integration

LCD Module

- **Display**: 2x16 or 4x16, 5x6 matrix
- **Custom Characters**: CG-RAM addressable
- **Control Pins**: RS, EN, WaitMS

- **Power**: USB 5V, LiPo 0.9–4.5V
- **Code Snippet**:

vbnet

```
Sub LCD_Custom_Clear()
    LCD_WriteByte(&H40)
    WaitMS(20)
End Sub
```

6. Section E: Hardware Block Diagram

Components

Type	Range/Model
Resistors	R1=330Ω, R2=680Ω
Capacitor	C1=1000nF
Inductor	TR1=PE-6561
Relays	RLY1–RLY16
Diodes	D1–D9
ADC Module	15-bit, 32kHz, 3V
Mounting	2x M3x15mm, 16-way

7. Section F: Compliance & Reissue Logic

- **Certificate Engine**: Modular Visual Basic logic with authority-specific branding
- **Audit Trail**: Scroll event normalization, I²C transaction logs, DAC bit mapping
- **Reissue Control**: Versioning, timestamping, authority seal injection
- **Chain-of-Custody**: UI interaction logs, hardware test signatures, LCD output snapshots

Would you like me to scaffold this into a printable layout with embedded logic blocks, authority branding zones, and reissue metadata fields? I can

also modularize it into a Visual Basic certificate engine with dropdowns for authority selection and dynamic field injection.

□ Visual Basic Code: Home Network + Metering System

□ Objective

Build a Visual Basic application that:

- Monitors electricity usage via smart meter interface.
- Displays real-time voltage/current readings.
- Logs data locally and optionally uploads to a remote server.
- Integrates basic network diagnostics (ping, connectivity).
- Supports USB or serial input from embedded meter hardware.

□ Core UI Components

vbnet

```
Public Class MeterForm
    ' Metering variables
    Dim voltage As Double
    Dim current As Double
    Dim power As Double

    ' Network status
    Dim isConnected As Boolean

    Private Sub MeterForm_Load(sender As Object, e As EventArgs) Handles
MyBase.Load
        Timer1.Interval = 1000 ' 1-second refresh
        Timer1.Start()
    End Sub

    ' Simulated meter read (replace with serial/USB input)
    Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles
Timer1.Tick
        voltage = GetVoltage()
        current = GetCurrent()
        power = voltage * current

        LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
        LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
        LabelPower.Text = "Power: " & power.ToString("F2") & " W"
    End Sub

    ' Network check
    Private Sub ButtonCheckNetwork_Click(sender As Object, e As EventArgs)
Handles ButtonCheckNetwork.Click
        isConnected = My.Computer.Network.IsAvailable
```

```
        LabelNetworkStatus.Text = If(isConnected, "Connected",
"Disconnected")
    End Sub

    ' Simulated data functions
    Function GetVoltage() As Double
        Return 220 + Rnd() * 5 ' Simulate 220V ±5V
    End Function

    Function GetCurrent() As Double
        Return 5 + Rnd() * 0.5 ' Simulate 5A ±0.5A
    End Function
End Class
```

🌐 Network Operations

Use `My.Computer.Network` for:

🌐 Network Operations

Use `My.Computer.Network` for:

- `IsAvailable`: Check connection status.
- `Ping`: Test server reachability.
- `DownloadFile` / `UploadFile`: For remote logging or firmware updates.

Explore more on

🔌 Metering Integration

From the PiCES journal:

- Use Visual Studio to interface with **electromechanical**, **electronic**, or **smart meters**.
- Readings captured in kWh, with tariff calculations.
- Supports **unit testing**, **integration testing**, and **data logging**

⚡ VISUAL BASIC CODE: Multi-Phase Metering & Calibration System

🎯 Objective

Design a Visual Basic application that:

- Reads and compares energy metrics (kWh, kVA, kVAR) across single-phase and three-phase systems.
- Supports calibration of industrial instruments: voltmeter, ammeter, phasemeter, cos φ meter.
- Logs daily (10 kWh), monthly (300 kWh/cell), and annual (360-day) indices.
- Differentiates between normal generation and emergency board panel readings.
- Interfaces with motor, heater, transformer, and substation meters.
- Calculates efficiency, losses, and phase displacement.

□ Core UI Components

```
Public Class CalibrationForm
    ' Energy metrics
    Dim kWh_Day As Double = 10
    Dim kWh_Month As Double = 300
    Dim kWh_Year As Double = kWh_Day * 360

    ' Instrument readings
    Dim voltage As Double
    Dim current As Double
    Dim powerFactor As Double
    Dim kva As Double
    Dim kvar As Double

    ' Phase metrics
    Dim phaseAngle As Double
    Dim cosPhi As Double

    Private Sub CalibrationForm_Load(sender As Object, e As EventArgs)
Handles MyBase.Load
        Timer1.Interval = 1000
        Timer1.Start()
    End Sub

    Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles
Timer1.Tick
        voltage = GetVoltage()
        current = GetCurrent()
        powerFactor = GetPowerFactor()

        kva = voltage * current / 1000
        kvar = kva * Math.Sin(Math.Acos(powerFactor))
```

```
        cosPhi = powerFactor
        phaseAngle = Math.Acos(powerFactor) * (180 / Math.PI)

        ' Display readings
        LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
        LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
        LabelKVA.Text = "kVA: " & kva.ToString("F2")
        LabelKVAR.Text = "kVAR: " & kvar.ToString("F2")
        LabelCosPhi.Text = "Cos φ: " & cosPhi.ToString("F2")
        LabelPhaseAngle.Text = "Phase Angle: " & phaseAngle.ToString("F2") &
"°"
    End Sub

    ' Simulated data functions
    Function GetVoltage() As Double
        Return 230 + Rnd() * 10
    End Function

    Function GetCurrent() As Double
        Return 15 + Rnd() * 2
    End Function

    Function GetPowerFactor() As Double
        Return 0.85 + Rnd() * 0.1
    End Function
End Class
```

✅ Calibration Logic

✅ Calibration Logic

- **Compare**: Normal vs Emergency board panel readings.
- **Indexing**: Daily, monthly, annual kWh tracking per cell.
- **Efficiency**: $Efficiency=Output PowerInput Power×100\text{Efficiency} = \frac{\text{Output Power}}{\text{Input Power}} \times 100$
- **Losses**: $Loss=Input Power−Output Power\text{Loss} = \text{Input Power} - \text{Output Power}$
- **Phase Displacement**: $ϕ=cos−1(Power Factor)\phi = \cos^{-1}(\text{Power Factor})$

✅ Instrumentation & Components

Instrument	Function
Ammeter	Current measurement
Voltmeter	Voltage measurement

Instrument	Function
Phasemeter	Phase angle detection
Cos φ Meter	Power factor calibration
Transformer	Load comparison
Motor/ Heater	Load simulation
Substation	Distribution metering

□ Data Byte Logging

- **Format**: Byte array per reading cycle
- **Fields**: Timestamp, kWh, kVA, kVAR, cos φ, phase angle
- **Storage**: Local CSV or remote SQL
- **Audit Trail**: Each reading tagged with calibration status and operator ID

Would you like me to scaffold this into a printable audit-grade calibration document with authority-specific branding, reissue logic, and chain-of-custody fields? I can also modularize it into a Visual Basic certificate engine with dropdowns for meter type, phase configuration, and calibration status.

□ Modular Report: Visual Basic Metering & Calibration System

□ Document Metadata

- **Title**: Multi-Phase Metering, Calibration & Instrumentation Framework
- **Author**: Tshingombe Tshitadi Fiston
- **Version**: 1.0
- **Date**: 23 September 2025
- **Scope**: Visual Basic UI logic, embedded metering, industrial calibration, and signal conditioning
- **Compliance Tags**: SAQA/NQF, PSIRA, SAPS, HR, CCMA, Labour

1. □ System Objective

Design a Visual Basic application that:

- Monitors and compares energy metrics (kWh, kVA, kVAR, cos φ) across single-phase and three-phase systems.
- Calibrates industrial instruments: voltmeter, ammeter, phasemeter, cos φ meter.
- Logs daily (10 kWh), monthly (300 kWh/cell), and annual (360-day) indices.
- Differentiates normal vs emergency board readings.
- Interfaces with motors, heaters, transformers, and substation meters.
- Calculates efficiency, losses, and phase displacement.

2. □ Visual Basic UI Logic

Form Controls

Control	Purpose
`LabelVoltage`	Displays voltage (V)
`LabelCurrent`	Displays current (A)
`LabelKVA`	Displays apparent power (kVA)
`LabelKVAR`	Displays reactive power (kVAR)
`LabelCosPhi`	Displays power factor (cos φ)
`LabelPhaseAngle`	Displays phase angle (°)
`Timer1`	Refreshes readings every second

Core Code Block

```
Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
    voltage = GetVoltage()
```

```
    current = GetCurrent()
    powerFactor = GetPowerFactor()

    kva = voltage * current / 1000
    kvar = kva * Math.Sin(Math.Acos(powerFactor))
    cosPhi = powerFactor
    phaseAngle = Math.Acos(powerFactor) * (180 / Math.PI)

    ' Display readings
    LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
    LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
    LabelKVA.Text = "kVA: " & kva.ToString("F2")
    LabelKVAR.Text = "kVAR: " & kvar.ToString("F2")
    LabelCosPhi.Text = "Cos φ: " & cosPhi.ToString("F2")
    LabelPhaseAngle.Text = "Phase Angle: " & phaseAngle.ToString("F2") & "°"
End Sub
```

3. □ Instrumentation & Calibration

Instruments

Instrument	Function
Ammeter	Current measurement
Voltmeter	Voltage measurement
Phasemeter	Phase angle detection
Cos φ Meter	Power factor calibration
Transformer	Load comparison
Motor/ Heater	Load simulation
Substation	Distribution metering

Calibration Metrics

- **Efficiency**: $Efficiency=Output PowerInput Power×100\text{Efficiency} = \frac{\text{Output Power}}{\text{Input Power}} \times 100$
- **Losses**: $Loss=Input Power−Output Power\text{Loss} = \text{Input Power} - \text{Output Power}$
- **Phase Displacement**: $ϕ=cos−1(Power Factor)\phi = \cos^{-1}(\text{Power Factor})$

4. □ Energy Indexing

Period	Consumption (kWh)
Daily	10
Monthly	300 per cell
Annual	3600 per cell

- **Comparison**: Normal vs Emergency board panel
- **Use Cases**: Industrial, business, residential

5. □ Data Byte Logging

Format

Field	Type
Timestamp	DateTime
Voltage	Double
Current	Double
kVA	Double
kVAR	Double
Cos φ	Double
Phase Angle	Double
Calibration Status	String
Operator ID	String

Storage

- Local: CSV or SQL
- Remote: Cloud dashboard or USB export
- Audit Trail: Tagged with calibration status and operator ID

6. □ Hardware Integration

Component	Value/ Model
Resistor R1	330 Ω
Resistor	680 Ω

Component	Value/ Model
R2	
Capacitor C1	1000 nF
Inductor TR1	PE-6561
ADC Module	15-bit, 32kHz
Relays	RLY1–RLY16
Diodes	D1–D9
Mounting	2x M3x15mm

7. □ Compliance & Reissue Logic

- **Certificate Engine**: Modular Visual Basic logic with authority-specific branding
- **Audit Trail**: Scroll event normalization, I²C transaction logs, DAC bit mapping
- **Reissue Control**: Versioning, timestamping, authority seal injection
- **Chain-of-Custody**: UI interaction logs, hardware test signatures, LCD output snapshots

Would you like me to help you format this into a printable layout with embedded branding zones and dropdown logic for authority selection? I can also scaffold a Visual Basic certificate engine to automate reissue and calibration logging.

□ Recommended Tools for Professional Layouts

□ Microsoft Word + Designer

- **Best for**: Certificate-grade documents, modular reports, compliance templates
- **Why**: Offers precise control over layout, headers, tables, and branding zones
- **Features**:

    - Styles for authority-specific sections (Labour, SAPS, PSIRA, etc.)
    - SmartArt for wiring diagrams and logic flows
    - Integration with Visual Basic code snippets via Developer tab

Microsoft Excel

- **Best for**: Metering logs, calibration tables, energy indexing
- **Why**: Ideal for structured data, formulas, and audit trails
- **Features**:
    - Conditional formatting for calibration status
    - Pivot tables for phase comparison and loss analysis
    - Embedded charts for kWh/kVA trends

Microsoft PowerPoint

- **Best for**: Visual logic diagrams, wiring plans, and training modules
- **Why**: Great for presenting embedded systems and UI flows
- **Features**:
    - Slide layouts for signal conditioning blocks
    - Icons and shapes for relays, meters, transformers
    - Export to PDF for distribution

Canva (Pro or Free)

- **Best for**: Certificate design, branded documentation, visual dashboards
- **Why**: Drag-and-drop interface with professional templates
- **Features**:
    - Custom fonts and logos for authority branding

- Layouts for calibration certificates and audit seals
- Export to high-resolution PDF or PNG

□□ Visual Studio (with Report Designer or RDLC)

- **Best for**: Embedded Visual Basic report generation
- **Why**: Native integration with your VB codebase
- **Features**:
  - Dynamic fields for meter readings, timestamps, operator ID
  - Authority-specific templates with dropdown logic
  - Export to PDF or print-ready formats

□ LaTeX (via Overleaf or TeXstudio)

- **Best for**: Precision technical documentation and mathematical calibration reports
- **Why**: Ideal for formula-heavy layouts and structured logic
- **Features**:
  - Clean separation of sections, equations, and tables
  - Bibliography and version control for audit compliance
  - Custom class files for certificate formatting

```
    ' Button1: Set label to white



    ' Button2: Set label to gray (value 254)



    ' ScrollBar: Adjust RGB dynamically



    ' I2C write/read sequence for soft revision



    ' Returns bearing as byte



    ' Returns bearing as word (hi/lo byte)


Sub LCD_Custom_Clear()
    LCD_WriteByte (&H40)
    WaitMS (20)
End Sub

Def LCD_Char(0) = {31, 24, 25, 25, 27, 31, 31, 31}
?? BLOCK DIAGRAM ELEMENTS
"   Relays: RLY1-RLY16
"   Diodes: D1-D9
```

" Reader Module: 15-bit ADC, 32kHz clock, 3V amplitude

" Model: 408 IB QUAD

" Mounting: 2x M3x15mm, 16-way

?? Modular Audit-Ready Documentation Blueprint

1. Title Page

" Document Name: Visual Basic UI + Embedded Systems Integration Framework

" Author: Tshingombe Tshitadi Fiston

" Scope: RGB UI logic, DAC signal conditioning, LCD interfacing, I²C compass integration, and lab-grade component mapping

" Version: 1.0

" Compliance Tags: SAQA/NQF, PSIRA, SAPS, HR, CCMA, Labour

2. Section A: Visual Basic UI Logic

?? RGB Scroll-Controlled Label

" Form Controls: Label1, Label2, Button1, Button2, HScrollBar1

" Resolution: 8-bit (0-255), scaled from 0-2550

" Code Block: Fully documented with event handlers and color logic

" Audit Notes: Scroll normalization, color feedback, UI responsiveness

3. Section B: Embedded Signal Conditioning

?? Binary Weighted DAC

" Bit Mapping: BIT3 to BIT0

" Voltage Equation: $VOUT=(?1×VBIT3)+(?0.5×VBIT2)+(?0.25×VBIT1)+(LSB)V_{OUT} = (-1 \times V_{BIT3}) + (-0.5 \times V_{BIT2}) + (-0.25 \times V_{BIT1}) + (LSB)$

" Example: 0110 ? BIT3=0, BIT2=1, BIT1=1, BIT0=0 ? $VOUT=?0.5?0.25=?0.75VV_{OUT} = -0.5 - 0.25 = -0.75V$

" DAC Type: Passive attenuator cell, full-wave detector, differential mirror, bandgap reference

4. Section C: CMPS03 Compass I²C Interface

?? Functions

" CMPS03_SoftRevision()

" CMPS03_Bearing_Byte()

" CMPS03_Bearing_Word()

" Protocol: I²C start ? write ? read ? stop

" Audit Tags: Byte/Word resolution, restart logic, address mapping

5. Section D: LCD + Keypad Integration

?? LCD Module

" Display: 2x16 or 4x16, 5x6 matrix

" Custom Characters: CG-RAM addressable

" Control Pins: RS, EN, WaitMS

" Power: USB 5V, LiPo 0.9-4.5V

" Code Snippet:

vbnet

```
    LCD_WriteByte (&H40)
    WaitMS (20)
End Sub
```

6. Section E: Hardware Block Diagram

?? Components

Type	Range/Model
Resistors	R1=330?, R2=680?
Capacitor	C1=1000nF
Inductor	TR1 = PE - 6561
Relays	RLY1 - RLY16
Diodes	D1 - D9
ADC Module	15-bit, 32kHz, 3V
Mounting	2x M3x15mm, 16-way

7. Section F: Compliance & Reissue Logic

" Certificate Engine: Modular Visual Basic logic with authority-specific branding

" Audit Trail: Scroll event normalization, I²C transaction logs, DAC bit mapping

" Reissue Control: Versioning, timestamping, authority seal injection

" Chain-of-Custody: UI interaction logs, hardware test signatures, LCD output snapshots

Would you like me to scaffold this into a printable layout with embedded logic blocks, authority branding zones, and reissue metadata fields? I can also modularize it into a Visual Basic certificate engine with dropdowns for authority selection and dynamic field injection.

?? Visual Basic Code: Home Network + Metering System

?? Objective

Build a Visual Basic application that:

" Monitors electricity usage via smart meter interface.

" Displays real-time voltage/current readings.

" Logs data locally and optionally uploads to a remote server.

" Integrates basic network diagnostics (ping, connectivity).

" Supports USB or serial input from embedded meter hardware.

?? Core UI Components

vbnet

```
Public Class MeterForm
    ' Metering variables
    Dim voltage As Double
    Dim current As Double
    Dim power As Double

    ' Network status
    Dim isConnected As Boolean

    Private Sub MeterForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
        Timer1.Interval = 1000 ' 1-second refresh
        Timer1.Start()
    End Sub
```

```
    ' Simulated meter read (replace with serial/USB input)
    Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
        voltage = GetVoltage()
        current = GetCurrent()
        power = voltage * current

        LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
        LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
        LabelPower.Text = "Power: " & power.ToString("F2") & " W"
    End Sub

    ' Network check
    Private Sub ButtonCheckNetwork_Click(sender As Object, e As EventArgs)
Handles ButtonCheckNetwork.Click
        isConnected = My.Computer.Network.IsAvailable
        LabelNetworkStatus.Text = If(isConnected, "Connected", "Disconnected")
    End Sub

    ' Simulated data functions
    Function GetVoltage() As Double
        Return 220 + Rnd() * 5 ' Simulate 220V ±5V
    End Function

    Function GetCurrent() As Double
        Return 5 + Rnd() * 0.5 ' Simulate 5A ±0.5A
    End Function
End Class
?? Network Operations
Use My.Computer.Network for:
?? Network Operations
```

Use My.Computer.Network for:

" IsAvailable: Check connection status.

" Ping: Test server reachability.

" DownloadFile / UploadFile: For remote logging or firmware updates.

Explore more on

?? Metering Integration

From the PiCES journal:

" Use Visual Studio to interface with electromechanical, electronic, or smart meters.

" Readings captured in kWh, with tariff calculations.

" Supports unit testing, integration testing, and data logging

? VISUAL BASIC CODE: Multi-Phase Metering & Calibration System

?? Objective

Design a Visual Basic application that:

" Reads and compares energy metrics (kWh, kVA, kVAR) across single-phase and three-phase systems.

" Supports calibration of industrial instruments: voltmeter, ammeter, phasemeter, cos ? meter.

" Logs daily (10 kWh), monthly (300 kWh/cell), and annual (360-day) indices.

" Differentiates between normal generation and emergency board panel readings.

" Interfaces with motor, heater, transformer, and substation meters.

" Calculates efficiency, losses, and phase displacement.

?? Core UI Components

```
Public Class CalibrationForm
    ' Energy metrics
    Dim kWh_Day As Double = 10
    Dim kWh_Month As Double = 300
    Dim kWh_Year As Double = kWh_Day * 360

    ' Instrument readings
    Dim voltage As Double
```

```
    Dim current As Double
    Dim powerFactor As Double
    Dim kva As Double
    Dim kvar As Double

    ' Phase metrics
    Dim phaseAngle As Double
    Dim cosPhi As Double

    Private Sub CalibrationForm_Load(sender As Object, e As EventArgs) Handles
MyBase.Load
        Timer1.Interval = 1000
        Timer1.Start()
    End Sub

    Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
        voltage = GetVoltage()
        current = GetCurrent()
        powerFactor = GetPowerFactor()

        kva = voltage * current / 1000
        kvar = kva * Math.Sin(Math.Acos(powerFactor))
        cosPhi = powerFactor
        phaseAngle = Math.Acos(powerFactor) * (180 / Math.PI)

        ' Display readings
        LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
        LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
        LabelKVA.Text = "kVA: " & kva.ToString("F2")
        LabelKVAR.Text = "kVAR: " & kvar.ToString("F2")
```

```
        LabelCosPhi.Text = "Cos ?: " & cosPhi.ToString("F2")
        LabelPhaseAngle.Text = "Phase Angle: " & phaseAngle.ToString("F2") & "°"
    End Sub

    ' Simulated data functions


        Return 230 + Rnd() * 10
    End Function



        Return 15 + Rnd() * 2
    End Function


    Function GetPowerFactor() As Double
        Return 0.85 + Rnd() * 0.1
    End Function
End Class
?? Calibration Logic
?? Calibration Logic
"   Compare: Normal vs Emergency board panel readings.
"   Indexing: Daily, monthly, annual kWh tracking per cell.
"   Efficiency: $Efficiency=Output PowerInput Power×100\text{Efficiency} = \frac{\
text{Output Power}}{\text{Input Power}} \times 100$
"   Losses: $Loss=Input Power?Output Power\text{Loss} = \text{Input Power} - \
text{Output Power}$
"   Phase Displacement: $?=cos??1(Power Factor)\phi = \cos^{-1}(\text{Power
Factor})$
?? Instrumentation & Components
Instrument  Function
Ammeter Current measurement
Voltmeter   Voltage measurement
```

Phasemeter Phase angle detection

Cos ? Meter Power factor calibration

Transformer Load comparison

Motor/Heater Load simulation

Substation Distribution metering

??? Data Byte Logging

" Format: Byte array per reading cycle

" Fields: Timestamp, kWh, kVA, kVAR, cos ?, phase angle

" Storage: Local CSV or remote SQL

" Audit Trail: Each reading tagged with calibration status and operator ID

Would you like me to scaffold this into a printable audit-grade calibration document with authority-specific branding, reissue logic, and chain-of-custody fields? I can also modularize it into a Visual Basic certificate engine with dropdowns for meter type, phase configuration, and calibration status.

?? Modular Report: Visual Basic Metering & Calibration System

?? Document Metadata

" Title: Multi-Phase Metering, Calibration & Instrumentation Framework

" Author: Tshingombe Tshitadi Fiston

" Version: 1.0

" Date: 23 September 2025

" Scope: Visual Basic UI logic, embedded metering, industrial calibration, and signal conditioning

" Compliance Tags: SAQA/NQF, PSIRA, SAPS, HR, CCMA, Labour

1. ?? System Objective

Design a Visual Basic application that:

" Monitors and compares energy metrics (kWh, kVA, kVAR, cos ?) across single-phase and three-phase systems.

" Calibrates industrial instruments: voltmeter, ammeter, phasemeter, cos ? meter.

" Logs daily (10 kWh), monthly (300 kWh/cell), and annual (360-day) indices.

" Differentiates normal vs emergency board readings.

" Interfaces with motors, heaters, transformers, and substation meters.

"   Calculates efficiency, losses, and phase displacement.

2. ?? Visual Basic UI Logic

Form Controls

Control Purpose

LabelVoltage   Displays voltage (V)

LabelCurrent   Displays current (A)

LabelKVA   Displays apparent power (kVA)

LabelKVAR   Displays reactive power (kVAR)

LabelCosPhi Displays power factor (cos ?)

LabelPhaseAngle Displays phase angle (°)

Timer1 Refreshes readings every second

Core Code Block

```
Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
    voltage = GetVoltage()
    current = GetCurrent()
    powerFactor = GetPowerFactor()

    kva = voltage * current / 1000
    kvar = kva * Math.Sin(Math.Acos(powerFactor))
    cosPhi = powerFactor
    phaseAngle = Math.Acos(powerFactor) * (180 / Math.PI)

    ' Display readings
    LabelVoltage.Text = "Voltage: " & voltage.ToString("F2") & " V"
    LabelCurrent.Text = "Current: " & current.ToString("F2") & " A"
    LabelKVA.Text = "kVA: " & kva.ToString("F2")
    LabelKVAR.Text = "kVAR: " & kvar.ToString("F2")
    LabelCosPhi.Text = "Cos ?: " & cosPhi.ToString("F2")
    LabelPhaseAngle.Text = "Phase Angle: " & phaseAngle.ToString("F2") & "°"
End Sub
```

3. ?? Instrumentation & Calibration

Instruments

Instrument Function

Ammeter Current measurement

Voltmeter Voltage measurement

Phasemeter Phase angle detection

Cos ? Meter Power factor calibration

Transformer Load comparison

Motor/Heater Load simulation

Substation Distribution metering

Calibration Metrics

" Efficiency: $Efficiency=Output PowerInput Power×100\text{Efficiency} = \frac{\text{Output Power}}{\text{Input Power}} \times 100$

" Losses: $Loss=Input Power?Output Power\text{Loss} = \text{Input Power} - \text{Output Power}$

" Phase Displacement: $?=cos??1(Power Factor)\phi = \cos^{-1}(\text{Power Factor})$

4. ?? Energy Indexing

Period Consumption(kWh)

Daily 10

Monthly 300 per cell

Annual 3600 per cell

" Comparison: Normal vs Emergency board panel

" Use Cases: Industrial, business, residential

5. ??? Data Byte Logging

Format

Field Type

Timestamp DateTime

Voltage Double

Current Double

kVA Double

kVAR Double

Cos ? Double

Phase Angle Double

Calibration Status String

Operator ID String

Storage

" Local: CSV or SQL

" Remote: Cloud dashboard or USB export

" Audit Trail: Tagged with calibration status and operator ID

6. ?? Hardware Integration

Component Value / Model

Resistor R1 330 ?

Resistor R2 680 ?

Capacitor C1 1000 nF

Inductor TR1 PE-6561

ADC Module 15-bit, 32kHz

Relays RLY1 - RLY16

Diodes D1 - D9

Mounting 2x M3x15mm

7. ??? Compliance & Reissue Logic

" Certificate Engine: Modular Visual Basic logic with authority-specific branding

" Audit Trail: Scroll event normalization, I²C transaction logs, DAC bit mapping

" Reissue Control: Versioning, timestamping, authority seal injection

" Chain-of-Custody: UI interaction logs, hardware test signatures, LCD output snapshots

Would you like me to help you format this into a printable layout with embedded branding zones and dropdown logic for authority selection? I can also scaffold a Visual Basic certificate engine to automate reissue and calibration logging.

?? Recommended Tools for Professional Layouts

??? Microsoft Word + Designer

" Best for: Certificate-grade documents, modular reports, compliance templates

" Why: Offers precise control over layout, headers, tables, and branding zones

" Features:

o Styles for authority-specific sections (Labour, SAPS, PSIRA, etc.)

o SmartArt for wiring diagrams and logic flows

o Integration with Visual Basic code snippets via Developer tab

?? Microsoft Excel

" Best for: Metering logs, calibration tables, energy indexing

" Why: Ideal for structured data, formulas, and audit trails

" Features:

o Conditional formatting for calibration status

o Pivot tables for phase comparison and loss analysis

o Embedded charts for kWh/kVA trends

?? Microsoft PowerPoint

" Best for: Visual logic diagrams, wiring plans, and training modules

" Why: Great for presenting embedded systems and UI flows

" Features:

o Slide layouts for signal conditioning blocks

o Icons and shapes for relays, meters, transformers

o Export to PDF for distribution

?? Canva (Pro or Free)

" Best for: Certificate design, branded documentation, visual dashboards

" Why: Drag-and-drop interface with professional templates

" Features:

o Custom fonts and logos for authority branding

o Layouts for calibration certificates and audit seals

o Export to high-resolution PDF or PNG

???? Visual Studio (with Report Designer or RDLC)

" Best for: Embedded Visual Basic report generation

" Why: Native integration with your VB codebase

" Features:

- Dynamic fields for meter readings, timestamps, operator ID
- Authority-specific templates with dropdown logic
- Export to PDF or print-ready formats

?? LaTeX (via Overleaf or TeXstudio)

" Best for: Precision technical documentation and mathematical calibration reports

" Why: Ideal for formula-heavy layouts and structured logic

" Features:

- Clean separation of sections, equations, and tables
- Bibliography and version control for audit compliance
- Custom class files for certificate formatting

```
Sub ENHG()

End Sub
```